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Submitted Electronically and by Overnight Mail

Water Docket
United States Environmental Protection Agency
Mail Code 4203M
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Re: *Comments of the Massachusetts Port Authority on the United States Environmental Protection Agency (EPA) Proposed Effluent Limitation Guidelines and New Source Performance Standards for the Airport Deicing Category Docket No. EPA-HQ-OW-2004-0038*

Greetings:

On behalf of the Massachusetts Port Authority ("Massport") enclosed please find three copies of Massport's Comments on EPA's Proposed Effluent Limitation Guidelines and New Source Performance Standards for the Airport Deicing Category, Docket No. EPA-HQ-OW-2004-0038. Massport appreciates the opportunity to provide comments on the proposed rule.

Respectfully Submitted,

William L. Lahey

Enclosures

U. S. ENVIRONMENTAL PROTECTION AGENCY

Comments in Response to

Proposed Rulemaking for Effluent Limitation Guidelines and New Source Performance Standards for the Airport Deicing Category
74 *Fed. Reg*. 44,675 (August 28, 2009)

Docket No. EPA–HQ–OW–2004–0038

Submitted by

Massachusetts Port Authority

February 26, 2010

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The Massachusetts Port Authority ("Massport" or the "Authority") appreciates the opportunity to submit the following comments on the United States Environmental Protection Agency's ("EPA's") Effluent Limitations Guidelines and New Source Performance Standards for the Airport Deicing Category Proposed Rule, EPA–HQ–OW–2004–0038 FRL–8948–2, 74 *Fed. Reg.* 44,676 (August 28, 2009) (the "Proposed Rule").

I. Summary of Massport's Comments on the Proposed Rule

The Proposed Rule as applied to Massport's General Edward Lawrence Logan International Airport ("Boston-Logan" or the "Airport") in Boston, Massachusetts is inapt and unworkable. Operational and space constraints at Boston-Logan prevent the construction of centralized facilities for aircraft deicing proposed by EPA. Moreover, the Proposed Rule would impose staggering financial costs on Massport and the airlines and would cause enormous delays to the flying public. Yet these costs would produce no appreciable benefits to the receiving waters of Boston Harbor and would likely result in a net detriment to the environment when factors such as filling coastal wetlands and generation of additional volatile organic compounds ("VOCs"), nitrogen oxides ("NOx") and greenhouse gas emissions are taken into account. For all these reasons, Massport urges EPA to reconsider its Proposed Rule. If EPA does not revise the Proposed Rule to accommodate the constraints at Boston-Logan, the Airport and possibly other airports similarly situated would be entitled to a fundamentally different factor ("FDF") variance under the Clean Water Act ("CWA"), or a variance under such variance provisions as may and should be included in any modification to the Proposed Rule.

Deicing operations at Boston-Logan have been subject to comprehensive CWA stormwater discharge regulations since 1990. Nearly fifteen years of extensive Boston Harbor water quality studies demonstrate that deicing runoff from Boston-Logan does *not* impair water quality in Boston Harbor. Study data show no evidence of any violation of established water quality standards during any deicing season for deicer-related pollutants. These findings were most recently confirmed by the water quality study mandated by EPA. *This study determined that Boston-Logan did not cause any violations of water quality standards in the Harbor and did not present a potential for adverse affects from deicers used at the Airport.*

Currently, deicer use on aircraft at Boston-Logan is subject to a recently renewed National Pollutant Discharge Elimination System ("NPDES") permit issued by EPA Region 1 in 2007. In addition to the Boston Harbor water quality study described above, this permit requires Massport and each airline conducting deicing at Boston-Logan to develop tailored plans to reduce deicer discharges. These best management practice plans, which must be periodically reviewed and updated, provide the optimal mechanism for controlling water quality impacts from glycol-based deicer use at Boston-Logan without unduly interfering with the aviation safety and operational procedures of the Airport or the airlines operating at the Airport. The recent permit reflects EPA's implementation of best available technology and water quality standards.

In an effort to try to find a workable plan for compliance with the Proposed Rule, Massport retained several of the leading engineering consultants in the United States. These consultants conducted engineering analyses necessary for Massport to determine that, by any reasonable measure, it would be neither feasible nor cost-effective to construct centralized deicing facilities at Boston-Logan to comply with EPA's Proposed Rule, and that the only

possible centralized deicing pad option for Boston-Logan – expanding the existing Juliet Pad facility – would be wholly inadequate to deice 100% of departing aircraft, as the Proposed Rule mandates. Moreover, this Expanded Juliet Pad option would create unacceptable delays in departing flights, which would adversely affect the local, regional and national airspace. For example, during the approximately 112 days of deicing at Boston-Logan per year, the Proposed Rule would cause an additional delay for every aircraft deiced of between 10 and 25 minutes. In ten years, this additional delay per aircraft would jump to approximately 16 to 44 minutes. Moreover, during the approximately 27 days per year with moderate deicing conditions, the Proposed Rule would cause additional delay for every aircraft deiced of between 14 and 43 minutes. By the year 2020, this additional delay would balloon to approximately 24 to 78 minutes per deiced aircraft – far above the 15-minute delay threshold set by the Federal Aviation Administration ("FAA").[1] Moreover, the cost of these delays over the next ten years would be between $65 million and $167 million.

In response to EPA's invitation,[2] Massport developed detailed data and analyses on the space constraints at Boston-Logan affecting Massport's ability to install centralized deicing pads. This analysis conclusively demonstrates that constructing centralized deicing pads at Boston-Logan to comply with the Proposed Rule's requirement for pad deicing of all departing aircraft (i.e., the "100% throughput" requirement) is infeasible. To meet both EPA's proposed deicing runoff collection requirements at Boston-Logan and FAA requirements would require the filling of approximately 160 acres of Boston Harbor. Not only would it be impossible to obtain the necessary environmental permits for such a massive filling project, but EPA's published cost estimates grossly understate the actual costs for Massport to comply the Proposed Rule. EPA incorrectly projects the total capital costs of constructing centralized deicing pads and deicing runoff treatment facilities to be $73,427,651 – an inadequate estimate that fails to account for a number of fundamental factors that EPA should have but did not consider, and that dramatically underestimates compliance costs, particularly for Boston-Logan. After accounting for these Boston-Logan-specific factors, engineering experts estimate that it could cost **over $1.65 billion** for Massport to comply with the Proposed Rule **–** over **22 times** EPA's estimate. This would create an undue financial hardship on Massport and its users, the airlines and the flying public.

The use of anaerobic fluidized bed ("AFB") systems for the treatment of deicing runoff at Boston-Logan, as EPA proposes, is also infeasible and not cost-effective. Boston-Logan does not have available space to store the enormous volume of deicing runoff that would require treatment under the Proposed Rule. In addition, an AFB system would not be technologically capable of treating all of the deicing runoff that would be collected from the conceptual Expanded Juliet Pad or in the alternative ADF collection scenario of end-of pipe interception (*i.e.*, at-the-gate deicing with collection of deicing runoff from the North and West Outfalls).

[1] *See* http://www.bts.gov/programs/statistical_policy_and_research/source_and_accuracy_compendium/air_traffic_delay.html (Research and Innovative Technology Administration Bureau of Transportation Statistics web page entitled "Air Traffic Activity and Delay Data") ("A reportable delay recorded in OPSNET is defined in FAA Order 7210.55B as, 'Delays to Instrument Flight Rules (IFR) traffic of 15 minutes or more, experienced by individual flights, which result from the ATC system detaining an aircraft at the gate, short of the runway, on the runway, on a taxiway, and/or in a holding configuration anywhere en route shall be reported.'").

[2] *See* 74 Fed. Reg. 44676, 44692 (Aug. 28, 2009) (EPA request for "site-specific data and documentation on any space limitations that would affect an airport's ability to install deicing pads, along with recommendations for alternative ADF collection techniques if deicing pads are not feasible").

The costs of installing an AFB system at Boston-Logan, even if technologically possible, would be unreasonably high, especially in light of the minimal environmental benefit. Finally, as with centralized deicing pads and runoff storage capacity, siting an AFB system (or any other (non-AFB) treatment system) at Boston-Logan would require a substantial amount of available land, which Boston-Logan simply does not have.

While Massport's primary responsibility is the safety and security of its users, the Authority is committed to minimizing the impact of its operations on the neighboring communities and environment. Massport is an industry leader in working with its partners – airlines, fixed-base operators and other tenants – to address a wide range of environmental issues. Consistent with this leadership role, Massport has voluntarily eliminated its use of glycol products for runway deicing and replaced them with potassium acetate, as EPA proposes.

If EPA does not modify the Proposed Rule to reflect the site-specific conditions at Boston-Logan and at other similarly situated airports, Massport is entitled to an FDF variance under CWA §301(n). As documented in this comment letter, Boston-Logan satisfies the statutory criteria for obtaining such variance factors due to its severe space constraints, the extremely high costs (in excess of $1.65 billion) to build sufficient centralized deicing pad capacity to comply with both the Proposed Rule and FAA requirements, and the high level of VOC, NOx and greenhouse gas emissions from aircraft waiting to be deiced. These Boston-Logan-specific factors are "fundamentally different" from the factors considered by EPA in the development of the Proposed Rule.[3]

The Proposed Rule fails to account adequately for FAA standards, especially as applied to land-restricted airports. Those airports should not be placed in the position of choosing between the Scylla and Charybdis of compliance with EPA or FAA regulations. The apparent lack of coordination between EPA and the FAA in crafting the Proposed Rule is another reason why EPA should withdraw completely or rewrite the Proposed Rule.

II. Massport's Interest

A. Boston-Logan Overview

Boston-Logan serves as the primary commercial airport in New England and is the region's most critical transportation resource, providing a vital link to the national and international air transportation systems. It functions within a large, complex transportation and communications network that includes not only other aviation facilities, but also rail services, highways and advanced telecommunications. The transportation services provided at Boston-Logan – both passenger and air cargo – are essential to the economic success of the entire region.

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[3] In order to qualify for an FDF variance, a discharger's variance application must be "based solely on information and supporting data submitted to the Administrator during rulemaking" (or "information and supporting data the applicant did not have a reasonable opportunity to submit during such rulemaking"). 33 U.S.C. § 1311(n)(1)(B)(i), (ii). Massport believes that this comment letter and the information and supporting data submitted to EPA herewith provide sufficient grounds for EPA to grant Boston-Logan an FDF variance if requested. Massport nonetheless reserves its right to submit additional information and supporting data to EPA in accordance with applicable law.

Boston is the largest metropolitan area and the center of commercial activity in New England. The New England economy is largely based on a mix of travel-intensive service industries – including financial services, research and development, higher education, consulting, high technology, and health care – that depend on reliable air transportation services. Moreover, tourism is a key sector of the local and regional economies, and visitors come from all over the United States and the world. Over 18.3 million domestic and international visitors traveled to the greater Boston area in 2008, with a spending impact of about $7.2 billion.[4] These factors have led to Boston-Logan becoming the largest and busiest airport in the New England region.

In addition to supporting the inter-city travel needs of the New England region's businesses and facilitating the region's growing tourism trade, Boston-Logan itself is a major contributor to the regional economy. More than 50 airlines, including national and international passenger airlines, commuter airlines and all-cargo airlines, serve Boston-Logan. In addition to commercial airline services, Boston-Logan also handles general aviation activity. Moreover, over 100 aviation-related businesses provide airport support services. Currently, Boston-Logan employs approximately 12,000 workers and stimulates the New England regional economy by approximately $7 billion per year, or an average of $19.1 million per day.[5]

Since 2006, Boston-Logan has been among the 25 busiest airports in the United States and Canada, with over 26 million passengers and 371,000 total aircraft movements (i.e., take-offs and landings) per year. In 2008, for example, the Airport served more than 26.1 million passengers, moved 281,752 metric tons of cargo, and was ranked 21st overall among North American airports in total aircraft movements, with 371,604 take-offs and landings.[6] Moreover, in 2007, Boston-Logan was the 12th largest United States international gateway airport among non-hub airports based on the number of international passengers, handling 3.8 million international passengers.[7] In short, Boston-Logan plays a vital role in the region's current and future economic prosperity by ensuring fast and efficient access to the global marketplace.

Boston-Logan maintains its position as one of the United States' major airports despite the fact that it is extraordinarily "space-constrained," that is, that there is an extreme shortage of land available for its additional development or expansion. The Airport occupies approximately 1,750 acres of land and is surrounded on three sides by Boston Harbor and a fully developed urban neighborhood on the fourth side, as shown in Figure 1.[8] This makes geographic expansion

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[4] *See* http://www.bostonusa.com/partner/press/pr/statistics (Greater Boston Convention and Visitors Bureau statistics on tourism levels in greater Boston area). This is consistent with Boston-Logan's role as an "origin and destination" airport. Boston-Logan is primarily an "origin and destination" airport, meaning that most passengers either begin or end their air travel itinerary at Boston (versus hub airports at which passengers connect with other flights to reach their ultimate destination). *See* Affidavit of David Ishihara, Massport Director of Aviation Operations, dated February 24, 2010 (hereinafter "Ishihara Affidavit") (attached hereto as Exhibit 1), ¶ 4.

[5] *See* http://www.massport.com/about/about.html (Massport web page entitled "Who We Are"); http://www.massport.com/logan/about.asp (Massport web page entitled "About Logan").

[6] *See* http://aci-na.org/stats/stats_traffic (Airports Council International-North America traffic reports for North American airports in 2006, 2007 and 2008 (including total passenger, cargo and movement data)).

[7] *See* http://www.bts.gov/publications/pocket_guide_to_transportation/2009/html/table_04_07b.html ("Top 20 U.S. Gateways for Nonstop International Air Travel: 2006 and 2007," from Research and Innovative Technology Administration Bureau of Transportation Statistics' *Pocket Guide to Transportation 2009*).

[8] *See* Ishihara Affidavit, ¶ 5; Affidavit of Richard M. Bessom, Massport Program Manager for Horizontal Projects, dated February 24, 2010 ("Bessom Affidavit") (attached hereto as Exhibit 2), ¶ 4. Boston-Logan, which

virtually impossible.[9] Moreover, the existing footprint of Boston-Logan is relatively small given the high volume of traffic it experiences.[10] Indeed, Boston-Logan is the sixth most space-constrained airport in the country based on the number of aircraft operations per acre, as shown in Table 1. Additionally, Boston-Logan's unusual airfield layout, consisting of six different runways and numerous taxiways as shown in Figure 2, leaves virtually no space for new deicing facilities.[11] In short, as illustrated in Figure A below, there is only one small, inadequately sized area at Boston-Logan that is available for new deicing facilities.[12]

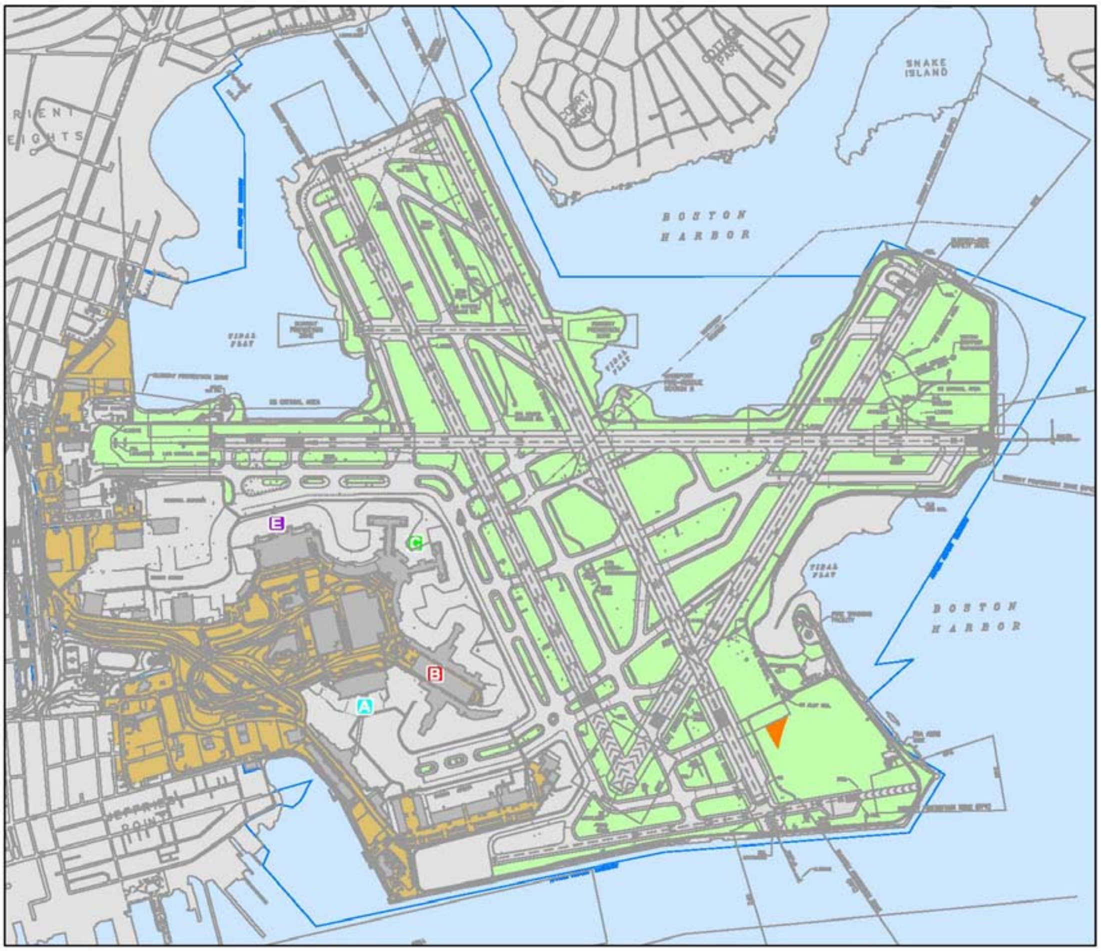

Figure A. The only area on the Boston-Logan airfield where development or construction would not interfere with runways, taxiways or FAA navigational aids is shown in orange (*i.e*., the small triangle in the southeast corner of the airfield) and is too small to site a centralized deicing pad.

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itself is located in East Boston and Winthrop, contains a total of approximately 2,370 acres of contiguous acres of land, of which approximately 619 acres are underwater. *See id.*

9 *See* Ishihara Affidavit, ¶ 5.

10 *See id.* ("Boston-Logan's footprint is small given the high volume of air traffic it accommodates - far smaller than other international airports in the snow-belt, including Chicago O'Hare with 10,000 acres and Denver with 33,000 acres.").

11 As discussed in Section V.A, the complex and intersecting layout of Boston-Logan's airfield provides necessary operating flexibility given the variable coastal winds and often poor weather conditions that the Airport experiences.

12 *See* Ishihara Affidavit, ¶ 24.

In addition, Boston-Logan is consistently ranked among the most delayed airports in the country.[13] Although the recent additions of Runway 14/32 and the centerfield taxiway have helped reduce delay, Boston-Logan continues to experience high demand for its relatively small size and capacity. For example, Figure B below compares the footprint of Boston-Logan with the footprints of Chicago-O'Hare, Dallas-Fort Worth and Denver International Airports.

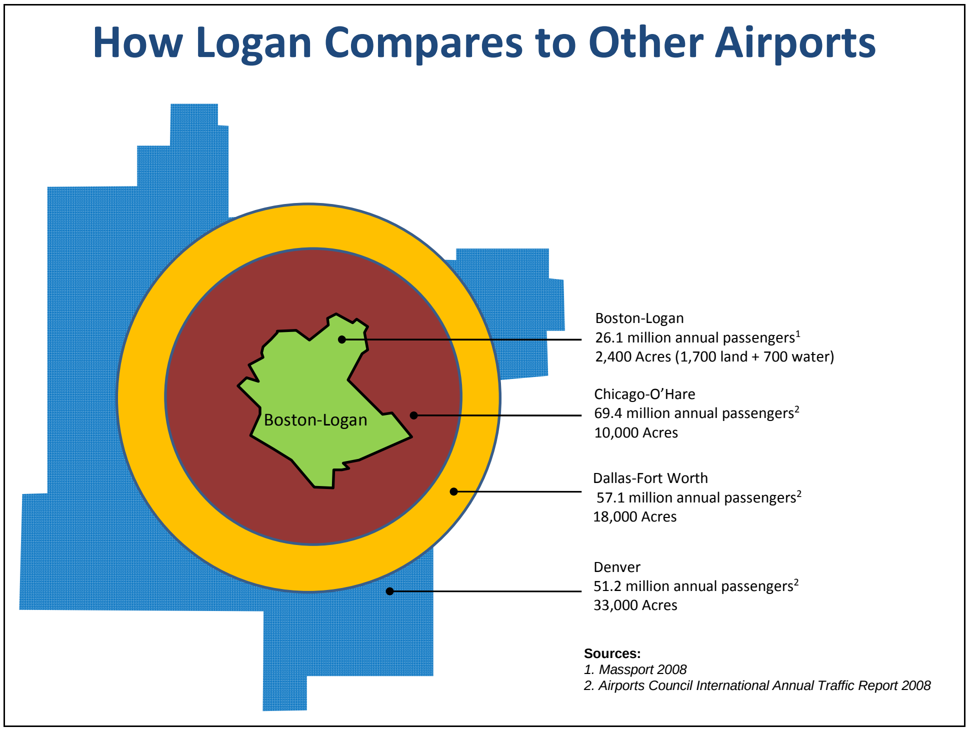

Figure B. Logan's Acreage Compared to Other Major Airports

B. Boston-Logan's Environmental Commitment

Boston-Logan is committed to being a responsible corporate citizen and good neighbor by working to minimize the impact of its operations on the neighboring communities and environment. It has worked with industry partners – airlines, fixed-base operators and other tenants – to address a wide range of environmental issues facing airports. For example, Boston-Logan is the first airport in the world to construct an airport terminal building, Terminal A, that has received the Leadership in Energy and Environmental Design ("LEED") certification by the United States Green Building Council. Further, during the past few years, Massport has implemented ISO 14001-certified Environmental Management Systems at a number of its facilities, including the Airport, designed to promote continual environmental improvement. In addition, Massport is committed to the installation and use of on-site renewable energy sources,

13 *See* http://www.bts.gov/programs/airline_information/airline_ontime_tables/2009_12/html/table_06.html (Bureau of Transportation Statistics, Ranking of Major Airport On-Time Arrival Performance Year-to-Date Through December 2009 (showing Boston-Logan as 17th most delayed major airport for 2008 and 18th most delayed major airport for 2009).

having installed wind turbines on Massport's administration building and solar panels at the Terminal B parking garage.

Massport is committed to continued environmental leadership. At the same time, it must carefully consider and balance the costs of these programs with the environmental benefits. So, too, must EPA. Because all costs related to Boston-Logan's stormwater program at the Airport are directly charged to the carriers, Massport must implement a cost-effective stormwater program that will not overburden an already burdened aviation industry. This requires a thorough understanding of the environmental issues and impacts of Boston-Logan's stormwater discharges generally and the aircraft deicing performed at Boston-Logan in particular, as well as the potential benefits of additional stormwater control measures. As explained, EPA has appropriately and effectively calibrated the existing NPDES permit for Boston-Logan and its unique conditions and constraints.

C. Deicing at Boston-Logan

Deicing is typically conducted at Boston-Logan from October or November through March or April. Two types of deicing operations are conducted at Boston-Logan: deicing of aircraft, and deicing of paved areas, including the runways, taxiways and ramp areas.[14]

Aircraft deicing occurs at Boston-Logan on approximately 112 days during the typical deicing season.[15] Notably, weather conditions requiring deicing are not limited to snow, sleet and freezing rain events – very often, deicing is necessary on cold, clear mornings to remove frost that has built up on aircraft overnight, in the absence of any precipitation.[16] Aircraft deicing is the responsibility of the individual airlines and is conducted by the airline (or its contractors) or Boston-Logan's sole fixed-base operator.[17] All use propylene glycol- or ethylene glycol-based Type I aircraft deicing fluids ("ADFs") and Type IV aircraft anti-icing fluids ("AAFs").[18] The vast majority of aircraft deicing at Boston-Logan currently is performed in the

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[14] *See* Ishihara Affidavit, ¶ 11; *see also* "Water Quality Impacts of Deicing at Boston Boston-Logan International Airport", prepared by EA Engineering, Science, and Technology, Inc., dated September 30, 2009 (hereinafter "2009 Boston-Logan Water Quality Study") (attached hereto as Exhibit 10) at p. 2.

[15] *See* "Aircraft and Passenger Delay and Costs Resulting from Centralized Aircraft Deicing at Logan International Airport," prepared by Simat, Helliesen, and Eisner, Inc. ("SH&E"), dated February 19, 2010 (hereinafter "SH&E Report") (attached hereto as Exhibit 7) at p. 12. Massport engaged SH&E, a leading aviation management consulting firm, to quantify the delays resulting from certain options evaluated to determine the feasibility of Boston-Logan's compliance with the Proposed Rule. The SH&E Report summarizes the result of this analysis. *See* Section V.D.2.b below.

[16] In fact, there were 78 days during the 2008-2009 deicing season at Boston-Logan, when there was no freezing snow or precipitation, but aircraft nonetheless required deicing because of frost conditions. This is more than twice the combined number of days when deicing was required due to freezing rain or light snow (*i.e.*, less than 4 inches of accumulation in a day) – 27 days – or heavy snow (*i.e.*, four or more inches of accumulation in a day) – seven days. *See* SH&E Report at pp. 4-5.

[17] *See* Ishihara Affidavit, ¶ 12.

[18] *See* 2009 Boston-Logan Water Quality Study at p. 15. Type I ADFs are used for removing frost, ice, and snow from aircraft surfaces; they are applied at various mixture strengths, depending on air temperature and deicing application equipment capabilities to adjust the mixture. In addition, Type IV anti-icing fluids are used as required to keep those surfaces free of frost, ice, or snow prior to an airplane taking off; Type IV products are applied without dilution. *See id.*

terminal gate areas.[19] Aircraft deicing is also performed at an off-gate location, the existing Juliet area, which can accommodate five narrow-body planes. This area, although known as Juliet "Pad," is simply a paved area in the southern portion of the airfield that is bounded by Taxiway J to the north and west, Runway 14 to the south and Taxiway J1 to the east.[20] The Juliet "Pad" is shown in Figure 2.

Pavement deicing and snow removal operations on runways, taxiways, ramp areas and roadways, and public sidewalks are primarily conducted by Massport (or its contractors).[21] Airside (i.e., ramp areas, taxiways, and runways) deicing is conducted using Society of Automotive Engineers ("SAE")-certified pavement-deicing materials ("PDMs").[22] Massport previously used a liquid glycol-based product, but has voluntarily switched from glycol to potassium acetate for runway and taxiway deicing.[23] Because this switch brings Boston-Logan into compliance with the pavement deicing requirements of the Proposed Rule, Massport is not commenting on those aspects of the rule.

The primary pathway for deicing runoff to reach surface waters is the discharge from Boston-Logan's stormwater outfalls. More than 97% of aircraft deicer use at Boston-Logan occurs within the drainage areas of the North and West Outfalls, both of which discharge to Boston Harbor as shown in Figure 4.[24] As explained below, under Boston-Logan's current NPDES permit, and based on periodic water quality testing conducted pursuant to that permit, EPA authorizes discharges of stormwater to Boston Harbor, including but not limited to, discharges from the North and West Outfalls. Section E below contains a further description of Boston-Logan's current NPDES permit.

D. Boston Harbor Water Quality

Extensive water quality studies all have found no material environmental impact to Boston Harbor waters from deicer runoff at Boston-Logan. The Commonwealth of Massachusetts' water quality standards require that dissolved oxygen ("DO") be no less than 5.0 milligrams per liter ("mg/L"). There is no evidence of water column DO concentrations falling below 5.0 mg/L during any of the deicing seasons over the 14-year period of record of the Massachusetts Water Resources Authority's ("MWRA's") monitoring program in the vicinity of Boston-Logan Airport. Similarly, historical receiving water data show a classic estuarine pattern with no measurable impacts from deicing discharges. Boston Inner Harbor is listed as impaired for pathogens and priority organics in the Commonwealth of Massachusetts' Clean Water Act §§ 305(b) and 303(d) listings for 2006, neither of which is related to deicing discharges at Boston-Logan.

As is more fully described in the following section, nearly fifteen years of Boston Harbor water quality testing has found no evidence of water quality falling below established water quality standards during any deicing season for pollutants associated with deicer use (*i.e.,*

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19 *See* Ishihara Affidavit, ¶ 12.
20 *See id.*
21 *See id.*, ¶ 11.
22 *See* 2009 Boston-Logan Water Quality Study at p. 2.
23 *See* Ishihara Affidavit, ¶ 11.
24 *See* 2009 Boston-Logan Water Quality Study at pp. iv and 3.

dissolved oxygen). These findings were most recently confirmed by the water quality study mandated by EPA in the current NPDES permit for Boston-Logan.

E. Boston-Logan's Current NPDES Permit

Boston-Logan currently discharges stormwater – including stormwater containing deicing runoff – to Boston Harbor pursuant to a NPDES permit issued by EPA Region 1 to Massport and co-permittees in 2007 (the "2007 Permit").[25] Massport applied to EPA for the permit in 1992 and updated its permit application at EPA's request in 2006.[26] EPA issued a draft NPDES permit on July 25, 2006. After consideration of the comments received during the public comment period, EPA issued a final NPDES permit – the 2007 Permit – and a lengthy written response to comments on July 31, 2007.[27]

EPA considered both technology-based and water quality-based requirements under the Clean Water Act ("CWA") in developing the 2007 Permit.[28] In the 2007 Permit, EPA authorizes the discharge of stormwater from Boston-Logan from four main outfalls draining the developed portions of Boston-Logan (plus 45 other lower volume outfalls which largely drain the runways and perimeter areas of the Airport).[29] In addition, the 2007 Permit required the preparation of a comprehensive water quality study to determine the impacts, if any, of Boston-Logan's deicer use on Boston Harbor waters.[30] Massport was required to submit both a study plan and a draft report to EPA (and the Massachusetts Department of Environmental Protection) for review and comment prior to the submission of the final report, which were both done.[31] The final water quality study (the "2009 Boston-Logan Water Quality Study") was submitted to EPA in September 2009.

That 2009 Boston-Logan Water Quality Study evaluated over 15 years of historic water quality data in the vicinity of Boston-Logan and collected new water quality data during the 2008-2009 winter deicing season, including daily logs of deicer use, episodic monitoring for deicing chemicals, and continuous monitoring for a variety of water quality parameters at the West and North Outfalls, all in accordance with EPA guidance. The 2009 Boston-Logan Water Quality Study found that deicer use at Boston-Logan did not have a material environmental impact on Boston Harbor. In particular, the 2009 Boston-Logan Water Quality Study found:

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[25] Forty-five states have assumed responsibility for issuing NPDES permits through delegation of NPDES program authority from EPA. There are only five states that are "non-delegated," meaning that EPA issues NPDES permits for dischargers in those states. Massachusetts is such a non-delegated state (the others are New Hampshire, Alaska, Idaho and New Mexico. *See* http://www.epa.gov/region1/npdes/issuers.html (EPA Region 1 web page entitled "Who Issues NPDES Permits in New England?").

[26] *See* "Logan International Airport, Fact Sheet, NPDES Permit No. MA0000787" dated July 25, 2006 (the "Fact Sheet"), p. 3.

[27] *See* "NPDES Permit MA0000787" dated July 31, 2007 (the "2007 Permit") and "Logan International Airport, NPDES Permit MA0000787, Response to Comments" dated July 31, 2007 (the "Response to Comments"). The 2007 Permit was appealed to the EPA Environmental Appeals Board ("EAB") on August 14, 2007; the EAB summarily dismissed this appeal on September 17, 2007.

[28] *See* Fact Sheet, p. 10.

[29] *See id*., p. 3.

[30] *See* 2007 Permit, Part D, p. 49.

[31] In March 2008, Massport submitted the Water Quality Study Plan. Later that year, it submitted the Phase I Water Quality Study Report. *See id*., pp. iv and 1,

- The 14 years of water quality data collected by the MWRA and the New England Aquarium in Boston Harbor showed "no evidence" of water quality falling below the established water quality standards during any deicing season for pollutants associated with deicer use (*i.e.*, dissolved oxygen, nitrogen or ammonium).[32]

- Detailed water quality data collected at three Boston-Logan outfalls (North Outfall, West Outfall and Outfall A21) during the 2008-2009 deicing season confirmed that Boston-Logan did not cause any violation of established water quality standards in Boston Harbor and did not present a potential for adverse environmental impacts in the receiving waters from any toxic materials in the deicers used at Boston-Logan.[33]

One reason for this lack of environmental impacts to the Boston Harbor receiving waters is the significant tidal exchange that occurs at Boston-Logan's outfall locations. These dynamic tidal conditions help to create a high dilution rate that eliminates the environmental risk to Boston Harbor from deicer discharges, as demonstrated in the 2009 Boston-Logan Water Quality Study.[34] Indeed, this high assimilative capacity is one reason why Boston Harbor water quality has been steadily improving.[35] This contrasts sharply with the receiving waters of many airports around the country, which are fresh-water systems, often with limited assimilative capacity. A prime example is Portland International Airport, where stormwater currently discharges to the Columbia Slough, the subject of an EPA Total Maximum Daily Load for dissolved oxygen that has relatively low wasteload allocations for airport deicing discharges.

The 2007 Permit also requires the development of a Storm Water Pollution Prevention Plan ("SWPPP"), including the design and implementation of Best Management Practices ("BMPs") aimed at the reduction of deicer use and deicing runoff discharges at Boston-Logan.[36] According to EPA, these requirements were designed "to meet the applicable Clean Water Act technology-based standards, namely … BAT for toxic pollutants (such as propylene glycol and ethylene glycol contained in many deicers) and … BCT for conventional pollutants (including BOD-which relates to deicing …)."[37] EPA considered these BMP requirements to constitute non-numerical effluent limitations.[38] The airline co-permittees developed BMPs in response to the 2007 Permit's requirements and Massport submitted these BMPs to EPA along with a certification of permit compliance (which is done annually). In short, the current effluent requirements in the 2007 Permit adequately, and with appropriate consideration of site-specific circumstances, protect Boston Harbor from adverse environmental impacts that could result from the use of glycol-based deicers at Boston-Logan.

III. The Existing FAA Regulatory Framework Governing Aircraft Deicing

How and where aircraft are deiced at Boston-Logan is governed by a complex regulatory regime under the jurisdiction of the FAA. As described below, this includes FAA regulations

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32 *See id.*, pp. iii and 9.
33 *See id.*, p. vii.
34 *See id.*, pp. 25-38.
35 *See* Response to Comments, p. 78.
36 *See* 2007 Permit, Parts 1.B.1 and 7.
37 *See* Response to Comments, p. 89.
38 *See id* at 82.

specific to deicing procedures and deicing facility design. Moreover, the location of aircraft deicing operations at Boston-Logan is also a function of extensive FAA requirements regarding already existing airport and runway design.

A. The FAA's Aircraft Deicing Regulations

Deicing aircraft is critical to ensuring safe flight operations during winter weather. The FAA regulates aircraft deicing through its "clean aircraft concept," which requires that all critical surfaces of an aircraft – such as wings, control surfaces and engine inlets – be free of frost, ice or snow at take-off.[39] The rationale behind this regulatory approach is that the presence of even small amounts of frost, ice or snow (referred to as "contamination") on these surfaces can cause a potentially dangerous degradation of the aerodynamic performance of an aircraft's lifting surfaces and unexpected changes in aircraft flight characteristics, with potentially catastrophic consequences.[40] Achieving and maintaining clean aircraft critical surfaces during winter weather therefore requires "deicing" – the removal of frost, ice, slush or snow from an aircraft to provide clean surfaces – sometimes followed by "anti-icing" – which protects against the formation of frost or ice and the accumulation of slush or snow on those clean surfaces for a sufficient period of time (the "holdover time") to keep an aircraft's critical surfaces free of ice-related contamination through taxiing and take-off.[41] Deicing and anti-icing, therefore, are often conducted on clear, blue-sky days, not only during snow and other precipitation events.

With the overriding priority of aviation safety, the FAA requires each aircraft operator (i.e., "certificate holder") to develop and implement an FAA-approved Ground Deicing and Anti-icing Program as part of its operating procedures[42] or obtain FAA approval for alternate

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[39] *See* 14 C.F.R. § 121.629(b) ("No person may take off an aircraft when frost, ice, or snow is adhering to the wings, control surfaces, propellers, engine inlets, or other critical surfaces of the aircraft or when the takeoff would not be in compliance with paragraph (c) of this section. Takeoffs with frost under the wing in the area of the fuel tanks may be authorized by the Administrator."); *id*. § 135.227 ("No pilot may take off an aircraft that has frost, ice, or snow adhering to any rotor blade, propeller, windshield, wing, stabilizing or control surface, to a powerplant installation, or to an airspeed, altimeter, rate of climb, or flight attitude instrument system," except under specified conditions); FAA Advisory Circular No. 120-60B, *Ground Deicing and Anti-Icing Program* (Dec. 20, 2004) ("FAA Deicing/Anti-Icing Program Advisory Circular"), § 6.d , at p. 5 ("the aircraft **must** be free of all frozen contaminants adhering to the wings, control surfaces, propellers, engine inlets, or other critical surfaces before takeoff") (emphasis in original). *See also* FAA Advisory Circular 135-16, *Ground Deicing and Anti-icing Training and Checking* (Dec. 12, 1994) ("FAA Deicing Training/Checking Advisory Circular"), (provides guidance regarding ground deicing and anti-icing training requirements that should be incorporated into approved training program for aircraft operators; ground deicing and anti-icing guidance for those aircraft operators that are not required to have approved training program; and pre-takeoff contamination aircraft checks required of certain aircraft operators); FAA Advisory Circular 120-58, *Pilot Guide Large Aircraft Ground Deicing* (Sept. 30, 1992) (provides recommendations for safe operation of large aircraft during icing conditions and guidelines for development of adequate procedures for deicing large aircraft); Airport Cooperative Research Program, Transportation Research Board, *Deicing Planning Guidelines and Practices for Storm Water Management Systems* (2009) ("ACRP Report 14"), at p. 1.

[40] FAA Deicing Training/Checking Advisory Circular, § 4, at p. 3.

[41] *See id.* § 3.a, b, at pp. 1-2 (FAA definitions of "deicing" and "anti-icing").

[42] *See* 14 C.F.R. § 121.629(c) ("Except as provided in paragraph (d) of this section, no person may dispatch, release, or take off an aircraft any time conditions are such that frost, ice, or snow may reasonably be expected to adhere to the aircraft, unless the certificate holder has an approved ground deicing/anti-icing program in its operations specifications and unless the dispatch, release, and takeoff comply with that program.").

procedures for conducting "pre-takeoff contamination checks."[43] Each operator's deicing practices are standardized in accordance with FAA requirements to ensure appropriate and consistent implementation. Underlining the FAA's paramount focus on safety, pilots have the authority to require additional deicing or anti-icing if they believe, in their sole discretion, that it is necessary for operation.[44] Aircraft deicing is most often conducted by aircraft operators or their contractors, but pilots always have the final responsibility regarding the adequacy of deicing as it may affect flight safety.[45]

One key component of every aircraft operator's FAA-approved Ground Deicing and Anti-icing Program is the operator's holdover time tables and procedures for using them. Holdover time (or "HOT") is the estimated time that deicing/anti-icing fluid will prevent the formation of frost or ice and the accumulation of snow on the protected surfaces of an aircraft. It begins when the final application of deicing/anti-icing fluid commences, and ends when the deicing/anti-icing fluid applied to the aircraft loses its effectiveness.[46] Unless an aircraft operator has obtained FAA approval to conduct pre-takeoff contamination checks, it must implement the current FAA-developed holdover time tables.[47] When the maximum applicable holdover time in an operator's holdover time table is exceeded – for example, because an aircraft has a long distance to taxi from a centralized deicing pad to its departure runway – take-off is only permitted under FAA regulations if the aircraft passes an authorized pre-takeoff contamination check or is "redeiced and a new holdover time is determined."[48]

In the Proposed Rule, EPA acknowledges the FAA regulates aircraft deicing, noting that "[c]ommercial airports and air carriers conduct deicing operations as required by the Federal Aviation Administration (FAA)."[49] It also acknowledges that the FAA – the federal agency that

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43 *See id.* § 121.629(d) ("A certificate holder may continue to operate under this section without a program as required in paragraph (c) of this section, if it includes in its operations specifications a requirement that, any time conditions are such that frost, ice, or snow may reasonably be expected to adhere to the aircraft, no aircraft will take off unless it has been checked to ensure that the wings, control surfaces, and other critical surfaces are free of frost, ice, and snow. The check must occur within five minutes prior to beginning takeoff. This check must be accomplished from outside the aircraft.") The authorization for conducting such "pre-takeoff contamination checks" in lieu of a full FAA-approved deicing/anti-icing program also must be obtained from the FAA and contained in the operator's operation specifications. *See id.*; *see also* FAA Deicing/Anti-Icing Program Advisory Circular, § 7, at p. 15

44 *See* 14 C.F.R. § 121.629(a) ("No person may dispatch or release an aircraft, continue to operate an aircraft en route, or land an aircraft when in the opinion of the pilot in command or aircraft dispatcher (domestic and flag operations only), icing conditions are expected or met that might adversely affect the safety of the flight."); *see also* ACRP Report 14, at p. 1.

45 *See* ACRP Report 14, at p. 3.

46 14 C.F.R. § 121.629(c)(3).

47 *See id.*; *see also* FAA Deicing Training/Checking Advisory Circular, § 6.c.2, at p. 5 ("HOTs that exceed those specified in the current editions of the FAA and manufacturer's specific HOT of approved fluids are *not acceptable*. However, the certificate holder may require the use of more conservative times than those specified in the FAA tables.") (emphasis supplied).

48 14 C.F.R. § 121.629(c)(3).

49 74 Fed. Reg. 44676, 44677 (Aug. 28, 2009). EPA also notes that:

> The Federal Aviation Administration requires airlines to deice aircraft and airfield pavement to protect the safety of passenger and cargo operations. FAA regulations in 14 CFR Part 121 require a complete deicing/anti-icing program. The regulations in 14 CFR Parts 121, 125 and 135 regulate takeoff when snow, ice, or frost is adhering to wings, propellers, control surfaces, engine inlets, and other critical surfaces of the aircraft.

Congress has given full jurisdiction over commercial airports, aircraft deicing and aviation safety – has determined in its discretion not to "require airlines to use a specific technology when deicing aircraft. In fact, airlines develop their own deicing protocols to meet the requirements of 14 CFR 125.221."[50] Moreover, EPA acknowledges that "[w]hile the FAA has issued regulations and guidance on conducting deicing/anti-icing operations, the aircraft pilot is ultimately responsible for determining whether the deicing performed is adequate."[51] Nonetheless, EPA is proposing to assume the responsibility of requiring airlines to use a specific deicing technology and to quantify the amount of deicing that is adequate (with its proposed 25-gallon allowance for taxiing). Thus, the Proposed Rule would inappropriately extend EPA's regulatory reach from pollution reduction to aviation safety matters.

B. The FAA's Airport Design Standards

In the interest of public safety, the FAA regulates essentially every aspect of aircraft takeoff, landing and movement on paved airport surfaces. Moreover, to ensure that aircraft have approach and departure pathways free of air navigation hazards and maintain appropriate distances from one another both in the air and on the ground, the FAA has issued both general "airport geometric design standards" aimed at ensuring airport "safety, economy, efficiency, and longevity," and specific runway and taxiway design standards.[52] All of these design standards are mandatory for airports seeking funding under the FAA's Airport Improvement Program ("AIP") or undertaking FAA-approved projects using fees collected through the Passenger Facility Charge ("PFC") Program.[53] As a result, at such airports – including Boston-Logan – the FAA's airport design requirements can dictate whether, and if so, where, the airport can site one or more centralized deicing facilities within its boundaries. In fact, at extremely land-constrained airports like Boston-Logan, these requirements can make it infeasible to site such a facility. More specifically, under the FAA's mandatory airport design standards:

- The siting and orientation of an airport's runways must account for, among other factors, (1) the operational and physical characteristics of the airplanes intended to operate at the airport,[54] (2) wind direction and velocity, (3) available airspace

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Id. at 44682.

50 *Id*. at 44682; *see also id.* ("Airlines typically select procedures for deicing/anti-icing their aircraft, which are then approved by the FAA.").

51 *Id*. at 44683.

52 FAA Advisory Circular 150/5300-13, *Airport Design* (Sept. 29, 1989, as revised) ("FAA Airport Design Advisory Circular"), § 200, at p. 9.

53 *See id.*, § 3, at p. i (while "[t]he standards and recommendations contained in this advisory circular are recommended by the [FAA] for use in the design of civil airports," "[f]or airport projects receiving Federal grant-in-aid assistance, the use of these standards is mandatory"). The AIP, also known as the "FAA Grants-in-Aid for Airports" program, provides funding to airports for infrastructure improvements such as safety, security and capacity projects. *See* http://www.faa.gov/airports/aip (primary FAA web page for AIP). The PFC Program allows the collection of PFC fees up to $4.50 for every enplaned passenger at commercial airports controlled by public agencies (such as Boston-Logan). Airports use these fees to fund FAA-approved projects that enhance safety, security or capacity; reduce noise; or increase air carrier competition. *See* http://www.faa.gov/airports/pfc (primary FAA web page for PFC Program).

54 *See* FAA Airport Design Advisory Circular, § 4, at p. 5 (which airport design criteria apply depend on Aircraft Approach Categories (which are based on aircraft approach speed) and Airplane Design Groups (which are based on airplane wing span or tailheight) of airplanes intended to operate at airport).

(considering, for example, FAA-designated control zones, special use airspace and restricted airspace), and (4) compliance with the regulatory mandate that there be no "obstructions to air navigation" that may impede departing or landing aircraft.[55]

- The use of certain land areas and airspace adjacent to and above runways and taxiways is restricted or prohibited in accordance with the FAA's "Object Clearing Criteria."[56] With respect to runways, these criteria proscribe the placement of certain "objects"[57] in the following FAA-delineated areas:

    - Runway Safety Area ("RSA"). The RSA is an unobstructed zone established around the perimeter of a runway to enhance safety in the event that an aircraft undershoots, overruns, or engages in an excursion from the side of the runway. Standard RSAs extend from 240 feet to 1,000 feet beyond each runway end and are between 120 feet and 500 feet wide. The size of a RSA depends on the type of instrument approach procedures and size and type of aircraft served by the runway. Only objects that need to be located in the RSA because of their function may be located in the RSA, and even they cannot be more than three inches above grade in height unless they are designed to break off at the three-inch mark if impacted.[58]

    - Runway Object Free Area ("OFA"). The Runway OFA is also centered on the runway centerline but covers a rectangular area over and from the end of the runway that is between 250 and 800 feet wide and between 240 and 1,000 feet long. All above-ground objects protruding above the RSA edge elevation must be cleared from the Runway OFA, although "it is acceptable to place objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes and to taxi and hold aircraft in the OFA."[59]

    - Obstacle Free Zone ("OFZ"). The runway OFZ and, when applicable, the inner-approach OFZ, the inner-transitional OFZ and the precision OFZ comprise the OFZ, which is a defined volume of airspace above the runway and, when applicable, above the approach area, along the sides of the runway OFZ and inner-approach OFZ, and above a 200 by 800 foot area beginning at the runway threshold. The OFZ may contain only frangible visual navigation aids ("NAVAIDs") that must be located in the

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55 *See id.*, § 202, at pp. 9-10; *see also* 14 C.F.R. §§ 77.21 – 77.25 (FAA standards for determining obstructions to air navigation at civil airports).

56 *See generally id*., § 211, at pp. 12-13 (entitled "Object Clearing Criteria").

57 The FAA defines such "objects" as including "above ground structures, NAVAIDs, people, equipment, vehicles, natural growth, terrain, and parked aircraft." *See id.* § 2, at p.2.

58 *See id*., § 305(e), at p. 22; *id*. § 211(a)(2), at p. 12. Taxiways also must have Safety Areas. *See id*.

59 *See id*., § 307, at p. 23. However, "[o]bjects non-essential for air navigation or aircraft ground maneuvering purposes" – including "parked airplanes" – are not to be placed in the OFA." *See id.* Taxiways also must have Object Free Areas. *See id*. § 211(a)(1v), at p. 12.

OFZ because of their function. The OFZ clearing standard otherwise precludes taxiing and parked airplanes, and "object penetrations."[60]

- The protected airspace made up of the FAA's five so-called "Part 77 imaginary surfaces," the penetration of which by "objects" such as above-ground structures, equipment, vehicles and parked aircraft represents a hazard to air navigation.[61]

- Runway Protection Zone ("RPZ"). The RPZ is a trapezoidal area that begins 200 feet beyond the end of the area usable for takeoff or landing. It has a central portion as wide as the Runway OFA, and controlled activity areas to either side of this central portion. While it is desirable to clear all objects from the RPZ, some uses are permitted, provided they do not attract wildlife, are outside of the Runway OFA, and do not interfere with NAVAIDs. The only land uses expressly prohibited from the RPZ are fuel storage facilities, residences and places of public assembly such as schools, hospitals, office buildings and shopping centers. Automobile parking facilities may be located in the controlled activity area of the RPZ.[62]

- Parallel runways and taxiways must be located to ensure proper separation of landing, departing and taxiing aircraft and thereby prevent runway or taxiway incursions – a paramount FAA goal.[63] For example, the FAA has established specific minimum distances between the centerlines of parallel runways based on factors including Aircraft Approach Category, Airplane Design Group, approach visibility minimums and whether anticipated simultaneous landings and takeoffs will use visual or instrument flight rules.[64]

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60 *See id.*, § 306, at pp. 22-23.

61 *See* 14 C.F.R. §77.25 (entitled "[c]ivil airport imaginary surfaces"). Of these five "imaginary surfaces": (1) the "Primary Surface" is a surface that is longitudinally centered on the runway, extending 200 feet beyond the end of the runway in each direction (in the case of paved runways); (2) "Approach Surface" is an inclined plane of varying width and slope extending outward and upward from the ends of the Primary Surface; (3) "Horizontal Surface" is a horizontal plane 150 feet above the established airport elevation, with dimensions governed by the runway service category and approach procedure; (4) "Transitional Surface" is an inclined plane with a slope of 7:1 extending upward and outward from the Primary Surface and Approach Surface, terminating at the Horizontal Surface; and (5) the "Conical Surface" is an inclined plane with a slope of 20:l extending upward and outward from the periphery of the Horizontal Surface for a horizontal distance of 4,000 feet. *See id.*

62 *See* FAA Airport Design Advisory Circular, § 212, pp. 12-13.

63 Reducing the risk of runway incursions is one of the FAA's top priorities. *See* http://www.faa.gov/airports/runway_safety/news/what_is (FAA Office of Runway Safety web page entitled "Runway Safety - News and Information: What is Runway Safety?"). Since October 2007, the FAA has taken a number of actions to improve runway safety, including (1) continuing to deploy and test new technology designed to prevent runway collisions; (2) promoting changes in airport layout, markings, signage and lighting; (3) issuing new air traffic procedures requiring controllers to give explicit instructions to pilots on precise routes to take from the gate to the runway; and (4) conducting safety reviews at 42 airports (including Boston-Logan, in June 2008). *See* Government Accountability Office, *Aviation Safety: FAA Has Increased Efforts to Address Runway Incursions*, GAO-08-1169T (Sept. 25, 2008), at pp. 12, 15. More recently, the FAA issued its 2009-2011 National Runway Safety Plan, in which it identified new and continuing runway safety initiatives. *See* http://www.faa.gov/airports/runway_safety/news/publications/media/RunwaySafetyReport-kh10-plan.pdf (2009-2011 National Runway Safety Plan).

64 *See* FAA Airport Design Advisory Circular,§§ 206-208, pp. 10-12; *see also id.* § 209, p. 12 (separation standards for parallel runways and taxiways/taxilanes based on Airplane Design Group).

C. The FAA's Aircraft Deicing Facility Design Standards

In addition to the airport design standards described above, the FAA has issued specific guidelines and standards for the siting, sizing and design of aircraft deicing facilities.[65] These requirements provide that aircraft deicing pads are to consist of two distinct areas: (1) an inner area for the parking of aircraft to receive deicing/anti-icing treatment, and (2) an outer area around the aircraft to allow simultaneous treatment by two or more mobile deicing vehicles.[66] The FAA has established specific safety and operational requirements for each of these areas based on the use of minimum separation distances and other buffer areas of specific dimensions, to ensure the safe and expedient entry, parking, deicing and exit of aircraft from the facility, and the safety of the personnel conducting the deicing and anti-icing activities in accordance with the aircraft operator's FAA-approved Ground Deicing and Anti-icing Program.[67] In addition, and significantly, the FAA's deicing facility requirements expressly incorporate the FAA clearance and separation standards described in Section III.B of this comment letter.[68]

With regard to number of deicing positions needed, the FAA requires that airports where deicing conditions are expected should have deicing facilities with a total deicing/anti-icing capacity "that approximates the airport's peak hour departure rate that the ATCT can manage during icing conditions."[69] Using this departure rate provides a basis for determining the number of deicing positions required to balance the number of planes departing on one hand and the holdover times of applied deicing/anti-icing fluids on the other, so that, to the extent practicable, applicable holdover times are in effect when pilots receive takeoff clearance. The FAA's deicing facility requirements also are keyed to ensuring compliance with holdover times, identifying the "primary factor for siting deicing facilities" as the "taxiing time that begins with the start of the last step of the deicing/anti-icing treatment and ends with takeoff clearance, such that the holdover times of fluids are still in effect."[70]

At the same time, the FAA takes into account the potential for delay from the use of deicing pads to meet its stringent aircraft deicing requirements (discussed in Section V.A above). The FAA deicing pad requirements provide that to maximize departure flows for all departing aircraft, a potential deicing facility site must have enough physical space to allow bypass taxiing

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65 For airports that build such facilities using AIP or PFC Program funds, use of these guidelines and standards is mandatory. *See* FAA Advisory Circular 150/5300-14B, *Design of Aircraft Deicing Facilities* (Feb. 5, 2008) ("FAA Deicing Facility Advisory Circular"), §2, at p.1. To the extent that Boston-Logan would use AIP or PFC Program funds for the construction of one or more aircraft deicing facility, it would be required to treat the FAA deicing facility requirements as applicable and mandatory. Therefore, for purposes of commenting on the Proposed Rule, Massport addresses these requirements as if they are mandatory for any aircraft deicing facility to be sited, sized, designed and built at Boston-Logan.

66 *Id*., § 1-2(d), at p. 1.

67 For example, the width of the aircraft parking area must equal the upper wingspan of the most demanding Airplane Design Group expected to use the deicing pad, and the length must equal the fuselage length of the most demanding aircraft expected to use the pad. *See id.*, § 3-1(a), at p. 9.

68 *Id*., § 2-2, at p. 3 ("To ensure aircraft safety, the location and operation of deicing facilities must follow the clearance and separation standards specified in AC 150/5300-13, *Airport Design*. These standards involve airspace, aircraft separations, FAA Technical Operations facilities critical areas, and Airport Traffic Control Tower (ATCT) line-of-sight criteria.").

69 *Id.* § 2-3, at p. 4.

70 *Id.* § 2-5, at p. 5.

capability for aircraft not needing treatment, so that the facility can receive aircraft that require treatment while allowing other aircraft to continue unimpeded for departure.[71]

The Proposed Rule fails to account for FAA standards as an overlay to compliance with the Rule, certainly as applied to established land-restricted airports. Those airports should not be placed in the position of choosing between the Scylla and Charybdis of compliance with EPA or FAA regulations. The lack of coordination between EPA and the FAA in crafting the Proposed Rule is another reason why EPA should withdraw completely or rewrite the Proposed Rule.

IV. Existing Clean Water Act Requirements and the Proposed Rule

A. Best Available Technology Economically Achievable ("BAT")

Under the CWA, EPA is authorized to establish effluent limitation guidelines ("ELGs") that apply to "classes and categories of point sources."[72] Promulgated effluent limitation guidelines are expected to represent the "best *available* technology *economically achievable*" ("BAT") to "result in *reasonable* further progress toward the national goal of eliminating the discharge of all pollutants," that is, the current level of effluent control that is both feasible and cost-effective for the designated category of point sources.[73]

To determine the level of pollutant reduction that is feasible and cost-effective for a particular industry, EPA must assess the following factors:

> the age of equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques, process changes, the cost of achieving such effluent reduction, non-water quality environmental impact (including energy requirements), and such other factors as the [EPA] Administrator deems appropriate.[74]

However, for BAT, even if a pollution reduction technology is technologically available or feasible, it must still be economically achievable – that is, cost-effective.[75] Here, as further

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71 *Id.* § 4-1(b), at p. 19.

72 *See* CWA § 304(b)(1)(A), 33 U.S.C. § 1314(b)(1)(A).

73 *See* CWA § 301(b)(2)(A), 33 U.S.C. § 1321(b)(2)(A) (CWA requires achievement of "effluent limitations for categories and classes of point sources, other than publicly owned treatment works, which ... shall require application of the best available technology economically achievable for such category or class, which will result in reasonable further progress toward the national goal of eliminating the discharge of all pollutants, as determined in accordance with regulations issued by the [EPA] Administrator pursuant to [CWA § 304(b)(2),] section 1314(b)(2) of this title, which such effluent limitations shall require the elimination of discharges of all pollutants *if* the Administrator finds, on the basis of information available to him ... that such elimination *is technologically and economically achievable* for a category or class of point sources as determined in accordance with regulations issued by the [EPA] Administrator pursuant to [CWA § 304(b)(2),] section 1314(b)(2) of this title ....") (emphasis supplied).

74 *See* CWA § 304(b)(2)(B), 33 U.S.C. § 1314(b)(2)(B).

75 *See BP Exploration & Oil, Inc. v. U.S. EPA*, 66 F.3d 784 (6th Cir. 1995) (upholding EPA's determination that available industry practice was not BAT due to unreasonably high costs); *American Petroleum Inst. v. EPA*, 787 F.2d 965, 972 (5th Cir. 1986) ("Indeed, EPA would disserve its mandate were it to tilt at windmills by imposing BAT limitations which removed de minimis amounts of polluting agents from our nation's waters, while imposing possibly disabling costs upon the regulated industry."); *Ass'n of Pacific Fisheries v. EPA*, 615 F.2d 794, 818 (9th

explained below, EPA is proposing the use of centralized deicing facilities – which EPA refers to, and this comment letter therefore hereinafter calls, "centralized deicing pads" – as BAT for ADF collection, and anaerobic fluidized bed treatment as BAT for ADF treatment.[76] For reasons that are discussed in detail in Sections V and VI below, neither centralized deicing pads nor anaerobic fluidized bed treatment are feasible or cost-effective technologies for Boston-Logan.

B. EPA's Proposed Rule

Under the Proposed Rule, airports with 10,000 or more annual departures would be required to collect available spent ADF and treat the associated wastewater to a specified numeric effluent limit prior to discharge. Specifically, at those airports with annual normalized usage of 460,000 or more gallons of ADF, EPA proposes to require the collection of 60% of available spent ADF, with centralized deicing pads identified as the model BAT for 60% collection. EPA has proposed three methods by which permitting authorities may direct such airports can demonstrate compliance with this ADF collection requirement: (1) certification that the airport is operating its centralized deicing pad(s) in accordance with EPA-mandated technical specifications;[77] (2) use of an EPA-approved alternate ADF collection technology; and (3) appropriate periodic monitoring in accordance with an EPA-approved monitoring program.[78] In addition, such airports would be required to treat all ADF wastewater collected on-site and discharged to surface waters to meet weekly average and daily maximum effluent limits for chemical oxygen demand ("COD"). The Proposed Rule has identified AFB systems as the model BAT for COD reduction in runoff containing ADF.

As explained in this letter, it is not feasible for Boston-Logan to comply with the two fundamental requirements of the Proposed Rule. The requirement for pad deicing of all departing aircraft during all weather conditions requiring deicing (i.e., the Proposed Rule's

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Cir. 1980) ("at some point extremely costly more refined treatment will have a de minimis effect on the receiving waters") (challenge to EPA regulations implementing BAT limits for seafood processing industry point sources).

[76] *See* 74 Fed. Reg. at 44677-44679.

[77] Proposed 40 C.F.R. § 449.20(b)(1)(ii) would require that

> [o]peration of a centralized deicing pad collection system in accordance with these technical specifications is sufficient to demonstrate compliance with a requirement to collect at least 60 % of the available ADF.
>
> (A) All aircraft deicing shall take place on a centralized deicing pad, with the exception of deicing for safe taxiing.
>
> (B) The volume of ADF used while deicing for safe taxiing shall not exceed 25 gallons of normalized ADF per aircraft.
>
> (C) Drainage valves associated with the centralized deicing pad shall be activated to collect spent ADF before deicing activities commence.
>
> (D) Deicing facilities shall be sized to accommodate the airport's peak hourly departure rate.
>
> (E) The minimum width of the centralized deicing pad shall equal the upper wingspan of the most demanding airplane design group using the deicing pad.
>
> (F) The minimum length of the centralized deicing pad shall equal the fuselage length of the most demanding aircraft using the pad.
>
> (G) Each centralized deicing pad must be equipped with a fluid collection system, such as a perimeter trench and diversion valve, to capture spent ADF and ADF-contaminated water.

Id. at 44717-44718.

[78] *Id*. at 44691-44692, 44701.

requirement for "100% throughput") is unworkable at Boston-Logan for aviation safety and economic feasibility reasons, and even if EPA approved the alternative approach of at-the-gate deicing coupled with collection of deicing runoff from all affected drainage outfalls (i.e., "end-of-pipe interception"), it would not be feasible to store and treat the estimated 94.2 million gallons of collected stormwater runoff containing glycol-based deicing materials at Boston-Logan.

V. The Proposed Rule Inappropriately Mandates the Use of Centralized Deicing Pads at Space-Constrained Airports Such As Boston-Logan

The Proposed Rule establishes centralized deicing pads as the model BAT for ADF collection at major airports with active deicing such as Boston-Logan.[79] However, EPA has ignored the realities of siting, building and operating a centralized deicing pad at space-constrained airports like Boston-Logan. EPA erroneously concludes that the "collection of ADF based on the use of deicing pads is technologically available" – in fact, "widely available to the industry" – and that even those airports that "appear[] to be the most land-constrained" will "have sufficient land to install" centralized deicing pads.[80] But centralized deicing pads are not technologically available to a busy airport like Boston-Logan, with its multiple runways and myriad operational complexities, just because certain other airports have available land to install such pads. Boston-Logan is one of the most space-constrained airports in the United States.[81] The Proposed Rule, as currently written, completely fails to account for the prohibitive impact that this lack of available land would have on the feasibility and cost-effectiveness of siting, building and operating a centralized deicing pad. In short, it would not be either feasible or cost-effective to use centralized deicing pads at Boston-Logan in the manner proposed by EPA in the Proposed Rule.

A. As a Space-Constrained Coastal Airport, Boston-Logan Already Faces Significant Operational Constraints.

Boston-Logan already struggles with significant operational constraints as a result of its limited land area and the highly variable winds associated with its coastal location. Boston-Logan maintains its position as one of the United States' major airports despite the fact that it is extraordinarily "space-constrained" – that is, that it occupies a land area that is small in relation to its high volume of traffic, and has a limited amount of space available within its property boundaries for additional or new development. Boston-Logan occupies approximately 1,750 acres of land in East Boston and Winthrop, immediately to the east of the densely populated

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79 While EPA is obligated only to identify a model technology and individual permittees may choose any technology that meets EPA's BAT standards, in this case EPA is essentially mandating only this one technology because it cannot identify – nor has Boston-Logan identified – any other technology that would achieve the 60% BAT standard consistent with CWA standards.

80 *Id.* at 44692. As discussed in Section VIII below, EPA's faulty conclusions are based on a deeply flawed and simplistic February 7, 2008 memorandum from ERG to EPA entitled "Estimated Deicing Pad Areas and Deicing Pad Space Evaluation."

81 Massport provides detailed data and documentation on Boston-Logan's space limitations in this letter in response to EPA's invitation to do so. *See* 74 Fed. Reg. at 44692 ("the Agency invites commentors to provide site-specific data and documentation on any space limitations that would affect an airport's ability to install deicing pads").

urban neighborhood of East Boston, and is surrounded on its other three sides by, respectively, the waters of Boston Harbor, Boston Inner Harbor and Winthrop Bay, as shown in Figure 1.[82] Moreover, almost all of the available space at Boston-Logan is already occupied by existing airfield or landside activities, as shown in Figures 2 and 3.[83]

In addition, the wind conditions at Boston-Logan are highly variable, with wind directions ranging around all points of the compass. Figure 5 shows the average percentage of time, over the course of a typical year, during which the wind blows from each of the four quadrants of the compass: 18% of the time, on an average annual basis, from the northeast, 37% from the northwest, 17% from the southeast and 28% from the southwest. This constantly changing wind direction necessitates a more complex airfield layout at Boston-Logan than at airports with less variable wind, with the result that Boston-Logan has six runways, aligned in a total of four directions, as shown in Figure 2.[84] Moreover, because the land area in which Boston-Logan is located is relatively small and limited to a peninsula, these runways and taxiways necessarily cross each other in many locations, requiring enhanced safety precautions to prevent runway incursions.[85]

As a general rule, aircraft must take off and land into the wind, especially as wind speeds increase. Personnel in the FAA air traffic control tower at Boston-Logan therefore determine the availability of specific runway configurations by wind speed and direction, as well as several other factors. For example, the FAA prefers to have at least three runways in use at Boston-Logan, and to separate arrivals from departures on different runways. Moreover, if possible, the FAA prefers to separate large and small planes on different runways, as a means of managing wake turbulence from large planes. Other factors that FAA air traffic controllers consider in determining runway usage at Boston-Logan include length of runways (heavier planes need longer runways), runway usability for instrument landings and noise restrictions (for example, jets are not allowed to arrive on Runway 22R or depart on Runway 4L).[86]

Based on all of these factors, departing aircraft typically must use the following runway configurations during the following wind conditions (as depicted graphically in Figure 6):

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82 *See* Ishihara Affidavit, ¶ 5; Bessom Affidavit, ¶ 4. In fact, Massport is prohibited by state law from expanding Boston-Logan past its existing western property boundary line into East Boston. *See* 1964 Mass. Acts 269.

83 *See* Ishihara Affidavit, ¶ 5 ("Boston-Logan's 1,751 acres of land are virtually fully occupied by the existing airfield, terminals, roadways, parking garages and other supporting infrastructure."); *id*. ¶ 25 ("Moreover, the use of any of the infield (grassland) areas on the airfield is further constrained, because almost the entire airfield is designated at the state level as 'Priority Habitat of Rare Species' and therefore regulated under the MA Endangered Species Act (321 CMR 10)."); Bessom Affidavit, ¶ 4 ("In the non-movement area, there is no vacant property within the airport boundary. The last developable area, the North Service Area, is slated for construction of a facility for maintenance of Massport buses. In addition, there is essentially no surface parking at the airport; all parking is in multi-level garages.").

84 *See* Ishihara Affidavit, ¶ 8. Each runway operates in two directions and is named according to the compass headings toward which its ends point. In addition, parallel runways having the same compass heading are designated "right" and "left." Therefore, Boston-Logan's six runways are 4L/22R, 4R/22L, 15L/33R, 15R/33L, 14/32 and 9/27. *See* Figure 2; *see also* Ishihara Affidavit, ¶ 6.

85 *See* Ishihara Affidavit, ¶ 9. The FAA defines a runway incursion as "[a]ny occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft." FAA, *2009 FAA Annual Runway Safety Report*, at p. 4.

86 *See* Ishihara Affidavit, ¶ 7.

- In a northeast wind, arrivals are on Runways 4L and 4R, and departures are from Runways 4L (except for jets), 4R and 9. This is the most common runway configuration utilized during deicing conditions.

- In a northwest wind, both arrivals and departures are on Runways 27 and 33L; if the wind is greater than 10 knots, Boston-Logan is allowed to use Runway 14/32 for smaller aircraft. This is the second most common runway configuration utilized during deicing conditions.

- In a southeast wind, arrivals are on Runway 15R and departures are from Runways 15R and 9. This is the third most common runway configuration utilized during deicing conditions.

- In a southwest wind, arrivals are on Runways 22L and 27, and departures are from Runways 22L and 22R. This runway configuration may be in use when morning deicing of frost is necessary.

- In certain weather conditions, only one runway is used for both arrivals and departures. In heavy snow and/or low visibility, Runway 4R is normally the runway used; in strong winds, the runway facing most directly into the wind is used.[87]

In sum, the Proposed Rule fails to account for any of these operational factors that space-constrained airports such as Boston-Logan would face in trying to comply with EPA's proposed requirements.

B. Because of These Operational Constraints, Compliance with the Proposed Rule and FAA Requirements Would Require Three Separate Centralized Deicing Pads at Boston-Logan

Massport carefully considered how it could comply with the Proposed Rule, including the requirement for deicing of every single departing aircraft at a centralized deicing pad. Massport's experienced in-house environmental and operational staff collaborated with outside experts from some of the leading consulting firms in the country to undertake an extensive analysis, focusing among other issues on ensuring that any proposed centralized deicing pad solution would not cause excessive departure delays and would be in compliance with FAA requirements in light of Boston-Logan-specific operational considerations.[88] As discussed in detail below, this analysis concludes that the only way Massport could comply with the Proposed Rule and FAA requirements would be to construct not just one but **three** separate centralized

[87] *See id.*, ¶ 8.

[88] The following consulting firms assisted in this analysis, including by providing the technical reports submitted to EPA in support of this letter: Camp, Dresser & McKee ("CDM"); CH2M HILL; Gresham Smith and Partners ("GS&P"); SH&E; and KB Environmental Sciences ("KBE").
and KB Environmental.

deicing pads, with one pad located at the end of each of the three sets of departure runways the Airport uses at varying times under deicing conditions.[89]

More particularly, to comply with both the Proposed Rule and FAA requirements and account for the fact that Boston-Logan must use different departure runways at different times depending on the prevailing wind direction and weather conditions, Massport would have to build and operate a centralized deicing pad at each of the following three locations: (1) on the north side of the Airport to serve Runways 22L, 22R, and 15R; (2) on the east side of the airport to serve Runways 33 Land, 27; and (3) on the south side of the airport to serve Runways 4L, 4R, and 9. (Runways 14, 15L and 33R are minimally used during deicing conditions.)[90] Such pads would be used in the following manner:

- In a northeast wind, with departures from Runways 4L, 4R and 9, aircraft would use the southern pad.
- In a northwest wind, with departures from Runways 27 and 33L, aircraft would use the eastern pad.
- In a southeast wind, with departures from Runways 15R and 9, aircraft would use the northern and southern pads.
- In a southwest wind, with departures from Runways 22L and 22R, aircraft would use the northern pad.[91]

Significantly, because of the Proposed Rule's 100% throughput requirement, each of these three pads would have to be built with the capacity to deice *all* aircraft departing during the time the winds remained from the particular direction requiring that pad's use.

As documented in the attached affidavit of David Ishihara, the Director of Aviation Operations at Boston-Logan, who has ten years of experience in aviation management, there are three primary reasons why these three separate centralized deicing pads would be needed to assure safe and functional compliance with the Proposed Rule.[92] The first reason is to minimize additional taxiing, because increased taxiing distance increases the potential for runway incursions and delay. Under Boston-Logan's current deicing practices, each plane gets deiced at the gate and then taxis directly to its departure runway. If aircraft were required to taxi from the gate to a centralized deicing pad located in one part of the airport, then to a departure runway in another part of the airport, the number of runway crossings occurring during taxiing – and thus the number of potential runway incursions – would greatly increase. Further, such increased taxiing time would have the potential to delay departure times. However, if a deicing pad were located near the end of each departure runway, taxiing distance would be only slightly increased

89 However, as explained below and in the Ishihara Affidavit, even the three-pad scenario would still cause operational and safety problems at Boston-Logan. *See* Ishihara Affidavit, ¶ 17.
90 *See id.*, ¶ 13.
91 *See id.*
92 *See id.*, ¶¶ 14-16.

above current conditions, and the potential for increased runway (and taxiway) incursions could be minimized.[93]

The second reason to have pads at each set of runway ends is to minimize the time between deicing/anti-icing and departure. As described above, pursuant to FAA requirements, aircraft have a limited window after deicing/anti-icing within which takeoff can be safely completed (the "holdover time"). Holdover times in some conditions are only a few minutes, so planes must be able to get from the deicing area to the departure runway in a short period of time.[94] The third reason for locating a pad at each set of runway ends is to prevent pad use from interfering with runway use. It would be difficult to locate one centralized deicing pad at Boston-Logan that did not cause intrusion into the ground surfaces and airspace protected by the FAA to ensure safe runway operation.[95]

Massport engaged CH2M HILL, Inc., a leading engineering firm with specific expertise in airport design,[96] to evaluate the feasibility of siting one or more centralized deicing pads at Boston-Logan to comply with both the Proposed Rule and FAA requirements. CH2M HILL's evaluation (hereinafter the "CH2M Hill Deicing Pad Report") confirmed Massport's operational conclusion that Boston-Logan would only be able to meet both the Proposed Rule's requirement for centralized deicing pad deicing of all departing aircraft during all weather conditions requiring deicing (that is, 100% throughput) and FAA requirements if it were to construct three centralized deicing pads, to the north, east and south of Boston-Logan's terminal areas.[97] CH2M HILL determined that the southern pad could be an expanded version of the existing Juliet "Pad," a paved area bounded by Taxiway J to the north, Runway 14 to the south and Taxiway J1 to the east that is currently used for off-gate deicing. However, because of the lack of available, usable space within Boston-Logan's existing footprint (except for a small triangle in the southeast corner of the airfield, as illustrated in Figure A above and Figures 3A and 3B attached), the only possible locations for the northern and eastern pads – at the end of Runway 22R, and at the end of Runway 33L, respectively – would require creating additional space by filling of approximately 160 acres of Boston Harbor tidelands. See Figure 7.

Specifically, the CH2M HILL Deicing Pad Report first determined that to handle Boston-Logan's existing fleet mix and operations *and* meet the Proposed Rule's 100% throughput requirement, a centralized deicing pad or pads would need to accommodate a maximum of 41 departures per hour during light deicing conditions,[98] and be sized for four (4) Airplane Design

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[93] *See id.*, ¶ 14.

[94] *See id.*, ¶ 15.

[95] *See id.*, ¶ 16.

[96] *See* http://www.ch2m.com/corporate/markets/transportation/aviation.asp (CH2M Hill Aviation web page, noting that CH2M Hill is 4th largest airport design firm in U.S. (as ranked by *Engineering News-Record*) and has completed more than 500 airport planning, engineering, environmental and construction management projects throughout U.S. and internationally during past 15 years).

[97] *See generally* "Analysis of Centralized Deicing Pad Feasibility at Logan International Airport," prepared by CH2M Hill, Inc., dated February 24, 2010 (hereinafter "CH2M Hill Deicing Pad Report") (attached as hereto as Exhibit 4).

[98] *See id.* at pp. 3, 4. Aircraft deicing was assumed to be that required during "light deicing conditions," that is, conditions under which deicing is required to remove, slush, ice or frost from aircraft critical surfaces such as wings, control surfaces and engine inlets, but (1) that do not result in runway closures or significant cancellations, and (2) under which departure rates are maintained at near the level of peak departure rates in good weather. Based

Group ("ADG") Group I/II, eight (8) Group III, two (2) Group IV and one (1) Group V aircraft, for a total of fifteen deicing positions.[99] In addition, it determined that to handle Boston-Logan's projected 2020 fleet mix and operations[100] and meet the Proposed Rule's 100 % throughput requirement, a centralized deicing pad or pads would need to accommodate a maximum of 48 departures per hour during light deicing conditions and be sized for five (5) Group I/II, nine (9) Group III, two (2) Group IV and one (1) Group V aircraft, for a total of 17 deicing positions.[101]

The CH2M HILL Deicing Pad Report designed deicing pads that would comply with the Proposed Rule and all applicable FAA requirements, including FAA Advisory Circular 150/5300-13, *Airport Design,* and FAA Advisory Circular 150/5300-14B, *Design of Aircraft Deicing Facilities.* This included designing each deicing position to have, for example, 12.5 foot wide Vehicle Maneuvering Areas and a 10 foot wide Vehicle Safety Zone for mobile deicing vehicles, and each pad to have additional space for storage and staging of support equipment such as mobile deicing vehicles and water and deicing fluid storage tanks, and a deicing ramp control building.[102]

Assuming that runway utilization during light deicing conditions would mirror Boston-Logan's historic runway utilization during winter weather conditions, as described above, the CH2M HILL Deicing Pad Report identified and evaluated the following three conceptual locations for centralized deicing pads at Boston-Logan (the "three-pad scenario"):

- <u>North Pad</u>: The North Pad would include 17 deicing positions laid out in accordance with FAA requirements, a 91,000 square foot support facility pad to provide staging areas for equipment, materials and support facilities and a 2,805,000 square foot spent ADF collection area (including a 500,000 square foot snow storage area), for a total pad area of 2,896,000 square feet. Because the North Pad's purpose would be to deice all aircraft departing from Runways 22L, 22R, and 15R, and because of the lack of existing, open land area in the vicinity of the ends of those runways, it was determined that the only possible location for the North Pad would be in the Boston Harbor (Winthrop Bay) tidelands near the approach end to Runway 22R, as shown in Figure 7. In fact, to build the North Pad, about 3,609,660 square feet, or

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on discussions with Massport aviation operations staff, as discussed below, it was assumed that in conditions heavier than such light deicing conditions, departures are constrained by airfield limitations and reduced schedules rather than the FAA-imposed requirement to deice, with the result that such light deicing conditions represent the most conservative, and therefore the appropriate, scenario to use for purposes of properly sizing a centralized deicing pad for Boston-Logan. *See id*. at p. 4.

According to Massport aviation operations staff, based on their experience with deicing at Boston-Logan, total time through the pad (including maneuvering into and out of position and communications with the deicing crew and the air traffic control tower), would be approximately 15-20 minutes during light deicing conditions. *See id*.; *see also* Ishihara Affidavit, ¶ 23.

99 *See* CH2M Hill Deicing Pad Report at pp. 4-5. Each ADG is a grouping of airplanes based on wingspan or tail height. *See* Table 1-1 of FAA Advisory Circular 150/5300-13, *Airport Design*.

100 The year 2020 was selected as the representative future year for purposes of the capacity analysis in accordance with FAA Advisory Circular No. 150/5300-14B, *Design of Aircraft Deicing Facilities*, which specifies the use of a 10-year planning period for proper pad sizing. *See* CH2M Hill Deicing Pad Report at p. 3. The 2020 fleet mix was assumed to mirror the representative current fleet mix. *See id*.

101 *See id*. at pp. 5-6.

102 *See id*. at p. 6.

approximately 83 acres, of tidelands would need to be filled or altered.[103] A theoretical layout for the North Pad is shown in Figure 8.

- East Pad: The East Pad would also include 17 deicing positions, a 91,000 square foot support facility pad and a 2,805,000 square foot spent ADF collection area (including a 500,000 square foot snow storage area), for a total pad area of 2,601,000 square feet. Because the East Pad's purpose would be to deice all aircraft departing from Runways 33L and 27, and because of the lack of existing, open land area in the vicinity of the ends of those runways, it was determined that the only possible location for the East Pad would be in the Boston Harbor tidelands near the approach end to Runway 33L, as shown in Figure 6. In fact, to build the East Pad, about 3,330,570 square feet, or over 76 acres, of tidelands would need to be filled or altered.[104] A theoretical layout for the East Pad is shown in Figure 9.

- Expanded Juliet Pad: The Expanded Juliet Pad would be an expanded version of the Juliet "Pad," an existing paved area in the Runway 14 overrun area that is bounded by Taxiway J to the north, Runway 14 to the south and Taxiway J1 to the east, and currently used for limited off-gate deicing. This pad should have 17 deicing positions, as described above, to comply with the Proposed Rule and deice all aircraft departing from Runways 4L, 4R, and 9. However, due to the anticipated difficulty in obtaining the required environmental permits and approvals, CH2M HILL evaluated the maximum possible theoretical buildout of the Expanded Pad Juliet within Logan's existing geographic boundaries, so as not require any expansion into, placement of fill in or alteration of Boston Harbor tidelands. As a result, the evaluated Expanded Juliet Pad would contain only nine deicing positions, rather than the 17 that would be required to accommodate either the existing or the projected 2020 peak departure rate.[105]

  A conceptual layout for the Expanded Juliet Pad is shown in Figure 10. The Expanded Juliet Pad would be laid out in accordance with FAA requirements for deicing facility design. However, due to space constraints, and because the pad would be located in an area of the Boston-Logan airfield that encompasses the Runway 14-32 RSA and critical FAA air space surfaces for Runway 9-27, all support facilities at the Expanded Juliet Pad would have to be portable so that no equipment would remain at the pad when deicing activities have been completed. Temporary support facilities would include a mobile control center, parking areas for deicing trucks, water trucks and mobile deicing fluid storage tankers, and portable lighting.[106]

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103 *See id*. at pp. 7-8. Figure 3B (attached hereto) illustrates that there is no available space within the Boston-Logan airfield to fit a centralized deicing pad containing the 17 deicing positions that would be required to comply with the Proposed Rule and FAA requirements. The only area on the Boston-Logan airfield where development or construction would not interfere with runways, taxiways or FAA navigational aids is shown in orange (*i.e.*, the small triangle in the southeast corner of the airfield), while the area would be required by a 17-deicing position centralized deicing pad is shown in darker blue.

104 *See id*. at p. 8.

105 *See id*.

106 *See id*. at p. 9.

C. It Would Not Be Feasible or Cost-Effective to Build Three Separate Centralized Deicing Pads at Boston-Logan.

The three-pad scenario is infeasible and impermissibly expensive.

1. It Would Be Impossible to Obtain the Permits Necessary to Build Three Separate Centralized Deicing Pads at Boston-Logan.

Constructing the three pads necessary for Boston-Logan to fully comply with EPA's 100% throughput requirement is not feasible. Obtaining the necessary federal, state and local permits to fill over either 76 acres of Boston Harbor to construct *one* new deicing pad, let alone permitting the filling of approximately 160 acres that would be needed for two pads, is simply unachievable. As documented in the Affidavit of Stewart Dalzell, Massport's Deputy Director of Economic Planning and Development, seeking to fill just 76 acres of Boston Harbor for one pad would be unprecedented in the modern era of environmental regulations.[107] It would require no fewer than ten (10) environmental permits from federal, state and local agencies, including at least two rarely-granted variances.[108]

Moreover, many of these environmental permit requirements require full mitigation, including replacement of all wetlands and tidelands to be filled in at least a one-to-one ratio, and probably more.[109] Boston-Logan would need, at a minimum, to construct approximately 160 acres of replacement wetlands in or around Boston Harbor. Additionally, those replacement wetlands would need to be constructed far enough away from Boston-Logan to comply with FAA regulations preventing wetland mitigation projects near airports, which have the potential to increase risks of airplane collisions with birds or other wildlife attracted to the replacement wetlands. It is unrealistic to believe that Boston-Logan could comply with these mitigation requirements.[110]

By contrast, Boston-Logan is currently in the process of seeking the environmental permits to fill less than five acres of Boston Harbor to construct RSA improvements at the end of two runways at Boston-Logan. This project, which involves filling a mere 4% of what would need to be filled or altered to build the North and East Pads, will take over five years and cost over $3 million to permit. Moreover, to reduce and mitigate impacts from this runway safety project, Boston-Logan has taken the extraordinary step of proposing to construct the RSA on a pile-supported deck (capable of supporting a fully-loaded Boeing 747-400) rather than a filled structure.[111]

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107 Affidavit of Stewart Dalzell, Massport Deputy Director of Economic Planning and Development, dated February 23, 2010 (hereinafter "Dalzell Affidavit") (attached as Exhibit 3), ¶¶ 6 and 7. As Massport's Deputy Director of Economic Planning and Development, Mr. Dalzell oversees Massport's efforts to obtain the environmental permits and approvals for its development projects. He has been in this position for nearly ten years and has over 20 years additional experience in preparing local, state and federal environmental filings including both aviation and marine projects. *See id.*, ¶ 1.

108 *See id.*, ¶¶ 4 and 6.

109 *See id.*, ¶ 7.

110 *See id.*

111 *See id.*, ¶¶ 4 and 7.

In sum, it is simply not achievable for Boston-Logan to obtain the environmental permits necessary to construct new deicing pads in Boston Harbor, let alone comply with the extensive mitigation measures that would be required.

2. It Would Be Extraordinarily and Impermissibly Expensive to Build Three Separate Centralized Deicing Pads at Boston-Logan.

Even if it were possible for Boston-Logan to obtain the necessary permits to fill portions of Boston Harbor for the North and East Pads, the cost to construct these two new pads is prohibitive. According to the CH2M HILL Deicing Pad Report, the estimated construction costs alone for the North and East Pads would total approximately $1.55 billion, without accounting for substantial necessary costs such as payments to the Commonwealth of Massachusetts for use of public tidelands, environmental mitigation costs and permitting costs.[112] Moreover, the estimated cost to construct the Expanded Juliet Pad would add another $22,300,000.[113] Thus, the projected construction costs alone for the three-pad scenario (not accounting for storage and other costs discussed below) would exceed *$1.57 billion*. By comparison, the cost to construct the new Terminal A at Boston-Logan – which is the newest terminal at the Airport, and the first LEED-certified airline terminal in the United States – was $350 million, less than 25% of the construction costs for the three-pad scenario. On this basis alone, the three-pad scenario is not, by any reasonable measure, practicable or economically feasible.

3. Operating Three Separate Centralized Deicing Pads at Boston-Logan Raises Unacceptable Aviation Safety and Operational Issues

In addition to these insurmountable permitting and financial barriers, the three-pad scenario presents the following aviation safety and operational issues:

- Because the North Pad would be located within the Runway 15L RSA and RPZ, operation of the North Pad would require Runway 15L-33R to be closed for arrivals and departures.

- Because the North Pad would be located in the Runway 15L RSA and Runway OFA, all equipment used within the boundaries of the RSA and Runway OFA would have to be portable. Additionally, permanent objects located on the North Pad but within the boundaries of Runway 15L RSA and Runway OFA could protrude no higher than three inches above the ground surface unless fixed by function, and would have to be mounted on frangible couplings that would shear at a height of three inches above the ground surface.

- Operation of the North Pad would require aircraft to taxi across Runway 15R-33L, which is used extensively during northwest and southeast wind conditions. This

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112 *See* CH2M Hill Deicing Pad Report at pp. 12-13. The rough order of magnitude cost for physical construction is approximately $779,000,000 for the North Pad and $772,000,000 for the East Pad. Again, these estimates do not include costs for non-construction related items such as land purchase, environmental mitigation and permits and approvals for construction in Boston Harbor. *See id.* at p. 13.

113 *See id.* at pp. 13-14.

configuration would increase the risk of runway incursions and potentially cause delays for aircraft waiting to cross Runway 15R-33L to taxi to the North Pad.[114]

- Operation of the East Pad would require aircraft to taxi across parallel Runways 4L-22R and 4R-22L, which together comprise the runway configuration most used during low visibility operations. This deicing pad location would increase the risk of runway incursions and potentially cause delays for aircraft waiting to cross the two parallel runways to taxi to the East Pad.[115]

Further, aircraft would need to taxi from the gate to one of the three pads before being deiced, but the Proposed Rule would allow only very minimal deicing – using no more than 25 gallons of ADF – at the gate. This limit of 25 gallons of ADF could pose a safety hazard from planes taxiing covered with ice and snow.[116] Finally, sending both large and small planes to the same pad could be problematic, because jet blast presents a hazard to small planes.[117]

4. Conclusions Regarding the Three-Pad Scenario

Boston-Logan would only be able to comply with both the Proposed Rule and FAA requirements if it were to construct three centralized deicing pads, to the north, east and south of Boston-Logan's terminal areas. Because of the space constraints imposed by Boston-Logan's geographic boundaries, the only possible locations for the North and East Pads would require the filling or alteration of approximately 160 acres of Boston Harbor tidelands. It would be impossible to obtain the environmental permits and approvals necessary for such a massive filling project. Moreover, even if such permits and approvals could be obtained, the cost of building the three-pad scenario far exceeds $1.57 billion. Finally, the three-pad scenario presents a number of unacceptable aviation safety and operational problems. In short, there are no other workable alternatives for siting, building and operating fully compliant centralized deicing pads at Boston-Logan.

D. The Only Potentially Feasible Location for a Centralized Deicing Pad at Boston-Logan, the Expanded Juliet Pad, Would Present Unacceptable Aviation Safety and Operational Problems.

1. The Only Potentially Feasible Location for a Centralized Deicing Pad at Boston-Logan Is the Expanded Juliet Pad.

As detailed in the attached Affidavit of Director of Aviation Operations David Ishihara, Massport evaluated the few areas of open space on or adjacent to the airfield and determined that

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114 *See id.* at pp. 10-11.

115 *See id.* at p. 11.

116 It is inappropriate for EPA to dictate what maximum volume of deicing fluid may be applied to aircraft – this relates directly to aviation safety and thus is clearly within the jurisdiction of the FAA. *See generally* Section III.A above.

117 *See* Ishihara Affidavit, ¶ 17.

there is only one feasible location for siting a centralized deicing pad, the location of the existing Juliet Pad.[118]

In most of the airfield, the complex layout of runways and taxiways leaves insufficient room for a centralized deicing pad. There are only a few possible exceptions, and each poses certain difficulties that would make it infeasible for a pad location:

- General Aviation or Cargo Aprons: These areas are too congested with ground service equipment and aircraft, and are too far from the departure ends of the three sets of runways used during deicing conditions, to represent feasible pad locations.[119]

- Governors Island: Boston-Logan also evaluated placing a centralized deicing pad in the Governors Island area, between the approach ends of Runways 4R and 32. However, this would interfere with FAA aeronautic navigational aids ("NAVAIDs") and FAA-protected ground and airspace (*i.e.*, "FAA critical surfaces"). In addition, there would be a potential for runway incursions due to the placement of runway and safety area crossings for aircraft and vehicles traveling to and from this pad. Finally, the only runway this pad would efficiently serve is Runway 4R, which could be served by the Expanded Juliet Pad.[120]

- Taxiway C: The Taxiway C area is midfield between Taxiways C, F and G, and Runway 4R/22L and near the departure ends of Runways 33L and 27 (see Figure 2). Operational issues make this location infeasible. Because of Boston-Logan's planned realignment of Taxiway G, the Taxiway C area could accommodate only a small deicing pad with room for two or three aircraft. Further, placement of a centralized deicing pad in this area would require aircraft to cross at least two runways to reach the pad, increasing the chance for runway incursions, particularly in the poor visibility conditions that accompany winter storms. The Taxiway C location also is logistically difficult for ground equipment (such as deicing vehicles) to reach and would require multiple runway crossings by vehicles, increasing the possibility of runway incursions.[121]

Thus, the only possible location for a centralized deicing pad is the existing Juliet Pad location. However, the use of the Expanded Juliet Pad as the only centralized deicing pad for all aircraft departing Boston-Logan would create unacceptable operational and delay problems.

2. The Expanded Juliet Pad Presents Unacceptable Aviation Safety and Operational Problems.

Having determined that the existing Juliet Pad area is the only potentially feasible location for a centralized deicing pad at Boston-Logan, Massport asked CH2M HILL to develop a conceptual design of the maximum build out of the existing pad, adhering to FAA design

118 *See id*. ¶¶ 18-23.
119 *See id*., ¶ 20.
120 *See id*., ¶ 21.
121 *See id*., ¶ 22.

specifications. This design is shown in Figure 9. CH2M HILL determined that for Boston-Logan to meet the Proposed Rule's 100% throughput requirement, an Expanded Juliet Pad should contain a total of 17 deicing slots, including three Group IV/V slots, to accommodate projected levels of air traffic over the next ten years. However, due to the space constraints in that area, only a total of nine deicing slots, including two Group IV/V slots, would be able to fit on an expanded pad.[122]

As explained below, this conceptual Expanded Juliet Pad is unworkable. It will not achieve EPA's proposed mandate that 100% of deicing under all weather conditions take place on the pad. Moreover, it presents a host of unacceptable operational and delay problems.

a. The Expanded Juliet Pad Could Not Be Used For 100% Throughput.

The Expanded Juliet Pad was positioned and laid out in the only space within Logan's existing footprint available for the construction of a deicing pad. However, because of these space constraints, the Expanded Juliet Pad would be located at the approach end of Runway 14, in the Runway 14 RSA between the runway and Taxiway J. As a result, use of the Expanded Juliet Pad would be limited to times when Runways 14/32 and 9/27 are not in use. More particularly, the Expanded Juliet Pad could not be used when Runway 14/32 is open, because aircraft in deicing positions would violate Runway 14/32 RSA and Runway OFA criteria, and Runway 14 is used as a taxiway during deicing. In addition, vertical objects on the Expanded Juliet Pad would penetrate FAA critical airspace surfaces for Runway 9/27, so the pad could not be used when Runway 27 is active or when Runway 9 is being used for arrivals.

These runway incompatibilities would require Expanded Juliet Pad to be closed and all aircraft to be deiced at the gates when northwest wind conditions dictate the usage of Runways 27 and/or 32. The frequency of arrivals and departures during the peak deicing months in 2008 (January, February, March, November, and December) is shown in Table 3. Runway 27 was used for 37 – 43% of jet arrivals and 7 – 13% of jet departures each month. Runway 32 (which cannot be used for departures) was only used for 1 – 2% of jet arrivals during those months, but it is a crucial runway for smaller planes during northwest wind conditions. Thus, Expanded Pad Juliet cannot satisfy EPA's requirement that 100% of deicing occur at a centralized pad.

b. Use of the Expanded Juliet Pad Would Cause Unacceptable Congestion and Delay.

Boston-Logan is already one of the most congested airports in the country**.** Closing Runways 14/32 and 27 to departures in order to deice all departing aircraft at the Expanded Juliet Pad would cause unacceptable additional congestion and delay.

122 *See* CH2M Hill Deicing Pad Report at pp. 8-9.

i. Quantification of Delay and Associated Costs

Due to space constraints and the infeasibility of building into Boston Harbor, the Expanded Juliet Pad could not be sized large enough to accommodate all current and future throughput without delays. As discussed above, current peak departures would require 15 deicing slots, and projected 2020 peak departures would require 17 slots. However, the maximum number of slots that could be placed on the Expanded Juliet Pad is only nine.[123] In addition, the Expanded Juliet Pad would be distant from the departure ends of Runways 22R, 22L, 15R and 33L, any of which could be used during a deicing event, depending on wind and weather and subject to FAA runway selection.[124] The taxi distance, and thus the taxi time, from the Expanded Juliet Pad to these runway ends would be longer than from the gates.

Massport engaged SH&E, a leading aviation management consulting firm, to quantify delay resulting from the use of Juliet Pad due to increased taxi time and aircraft queuing due to pad capacity limitations.[125] SH&E estimated that, based on the current Boston-Logan departure rates, patterns, and fleet mix, deicing all aircraft at the Expanded Juliet Pad would result in total delays of 1,076 to 2,616 aircraft hours and 87,191 to 208,025 passenger hours annually.[126] The total annual indirect cost of such delays would fall between $4.4 million and $10.5 million.[127] At air traffic levels projected by the FAA for Boston-Logan for 2020, deicing all aircraft at the Expanded Juliet Pad would result in total delays of 1,900 to 5,251 aircraft hours and 152,272 to 415,153 passenger hours annually.[128] The annual indirect cost of such delays would be between $7.7 million and $21 million.[129] The total indirect cost of these delays over the next ten years would be between $65 million and $167 million.[130] Yet EPA did not evaluate delays to aircraft or passengers or their attendant costs in developing the Proposed Rule.[131]

On average, during the approximately 112 days of deicing at Boston-Logan per year, the Proposed Rule would cause an additional delay for every aircraft deiced of between 10 and 25 minutes. In ten years, this additional delay per aircraft would jump to approximately 16 to 44 minutes. Moreover, during the approximately 27 days per year with moderate deicing

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123 *See* Section V.B; *see also* CH2M Hill Deicing Pad Report at pp. 8-9.

124 *See* Ishihara Affidavit, ¶ 23.

125 *See generally* SH&E Report. To simplify the analysis, SH&E did not take into account closures of Expanded Juliet Pad due to runway incompatibilities.

126 *See id.* at pp. 7, 29.

127 *See id.* at pp. 9, 29.

128 *See id.* at pp. 7, 9, 29.

129 *See id.* at p. 9.

130 *See id.* at p. 10.

131 *See* "Economic Analysis for Proposed Effluent Limitation Guidelines and Standards for the Airport Deicing Category" (EPA-821-R-09-005) prepared by EPA dated July 2009, at p. 4-3 (EPA economic analysis in support of Proposed Rule) ("EPA believes that as long as deicing pads do not reduce the number of departures per hour below the limit caused by the weather itself, then the cost of delays is attributable to the bad weather, not the deicing pads. Although some aircraft might be delayed if they lose their spot in the queue, then these costs are offset by the benefit to aircraft that move up in the queue (although those aircraft may not be owned by the same carrier). ***Therefore, EPA did not estimate costs for potential delays that might be caused by deicing pads.***") (emphasis supplied).

conditions, the Proposed Rule would cause additional delay for every aircraft deiced of between 14 and 43 minutes. By the year 2020, this additional delay would balloon to approximately 24 to 78 minutes per deiced aircraft – far above the 15-minute delay threshold set by the FAA.

These delays would also result in increased emissions of airborne pollutants. Massport engaged KB Environmental Sciences, Inc. ("KBE"), experts in aviation air emissions modeling, to estimate the amounts of greenhouse gases ("GHGs") and other criteria air pollutants under the federal Clean Air Act that would be attributable to use of the Expanded Juliet Pad for deicing.[132]

The air emissions inventory presented in Table A shows the estimated increases in emissions of GHGs and other EPA criteria air pollutants (in additional tons emitted per deicing season) that would be expected if all aircraft departing Logan during deicing conditions were required to use the hypothetical Expanded Juliet Pad for deicing. More specifically, the results are reported for the EPA criteria pollutants and GHGs under the forecasted 2010 and 2020 "Low" and "High" utilization scenarios.[133]

Table A. Deicing Pad Emissions Results

	Emissions (tons/deicing season)								
	EPA "Criteria" Pollutants					Greenhouse Gases			
Scenario	**CO**	**NO_x**	**SO_2**	**$PM_{10/2.5}$**	**VOC**	**CO_2**	**N_2O**	**CH_4**	**CO_{2e}**
2010 Low	26	5	1	0.1	3	3,562	23	3	3,588
" High	63	13	4	0.4	7	8,440	55	6	8,502
2020 Low	46	9	3	0.3	5	6,197	40	5	6,243
" High	126	26	7	1	13	16,811	110	12	16,933

Notes: CO – carbon monoxide, NO_x – nitrogen oxides, $PM_{10/2.5}$ – particulate matter 10 and 2.5 microns, VOC – volatile organic compounds, CO_2 – carbon dioxide, N_2O – nitrous oxide, CH_4 – methane, CO_{2e} – greenhouse gases as carbon dioxide equivalents.

In general, these findings indicate that the use of the hypothetical Expanded Juliet Pad for compliance with the Proposed Rule would result in an increase ranging from <1 percent to 5 percent in the amounts of GHGs and other EPA criteria air pollutants emitted at Logan during a deicing season, in relation to the current levels of such emissions (as presented in the *Logan 2008 Environmental Data Report* ("EDR"),[134] depending on the pollutant, year (2010 or 2020) and scenario (Low or High).

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[132] *See generally* "Memorandum – Boston-Logan International Airport Deicing Pad Air Emissions Inventory," prepared by KBE, dated February 17, 2010 (hereinafter "KBE Air Emissions Report") (attached hereto as Exhibit 8). KBE assumed that all aircraft departing Boston-Logan during weather conditions requiring deicing would have to taxi to and from and be deiced at the Expanded Juliet Pad, as that hypothetical facility is described in the CH2M HILL Deicing Pad Report. *See id*. at p. 1. KBE did not try to estimate potential air emissions from aircraft auxiliary power units and ground support equipment (e.g., mobile deicing vehicles) associated with the use of the hypothetical Expanded Juliet Pad. *See id*. at p. 2.

[133] The aircraft operations and incremental aircraft taxi and queue times used in the assessment were provided by SH&E. *See id.* at p. 1.

[134] This report, which Massport issued on September 30, 2009, is available on Massport's web site at http://www.massport.com/about/pdf/ 2008EDR.pdf.

To put this increase in emissions in perspective, the projected increase in GHG (CO_{2e}) associated with the use of the Expanded Juliet Pad is approximately equivalent to that emitted by an additional 1,630 to 7,700 vehicles per deicing season day (depending on year and scenario, and assuming each vehicle travels 30 miles per day). Also, the increase in GHG is approximately equivalent to that emitted by an additional 1,300 to 6,300 Boeing B747 takeoffs per deicing season day (again, depending on year and scenario).

ii. Additional Unquantified Delays

There are additional delay issues that were beyond the scope of the SH&E analysis. While the potential costs of these delays were not quantified, the delays could be significant.

First, in addition to the queuing of all types of aircraft that would occur during peak departure times, SH&E determined that there could be additional times when more than just Group IV/V aircraft would have to queue due to a lack of slots of sufficient size. Only two Group IV/V slots could be placed on the Expanded Juliet Pad due to the pad's shape, but three Group IV/V slots would be required under both current and future conditions.[135] Table 4 shows January 2010 scheduled weekday departures by hour and aircraft group type. There are two hours each day with seven Group IV/V departures, and one with six. Assuming a deicing time of 20 minutes per plane, six is the maximum number of Group IV/V aircraft that could be deiced. Thus, these aircraft would be forced to queue during at least 2-3 hours of the day. The queuing could build up over multiple hours in the evening, when more large aircraft depart each hour because of international flights, as shown in Table 4**.**

In addition, as shown in Figure 10, one of the nine spots on Juliet Pad would have to be closed when additional snow storage space is needed. This capacity reduction could lead to additional delays. Further, increased taxi distances could increase the possibility that an aircraft would exceed its holdover time before takeoff, forcing it to return to the pad to be de-iced again. In addition, the routes would involve more crossings of runways and/or taxiways and might create two-way traffic on taxiways, all of which have congestion and safety implications.[136]

Finally, there would be a limited amount of space available on and near the Expanded Juliet Pad, which would lead to problems with aircraft movement. If the pad were full, aircraft could not wait at gates for positions to open up; they would have to be moved in order to accommodate arrivals and prevent inbound delays. Ground control would have to position these queuing aircraft along taxiways. This would cause congestion problems, which would be exacerbated if any aircraft had to return to the gate (e.g., if the crew exceeded its allowed hours, or if passengers had to be let off due to exceedance of time on the ground under new Department of Transportation regulations).[137]

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[135] *See* CH2M Hill Deicing Pad Report at p. 6.
[136] *See* Ishihara Affidavit, ¶ 23.
[137] *See id*.

iii. Additional Unquantified Impacts of Delay

There are a number of problems caused by delay that are specific to Boston-Logan. Boston-Logan, as an "origin and destination" (rather than hub) airport, has a balanced flow of arrivals and departures, so constraints on departures also will affect arrivals. Also, because people are often flying from Boston-Logan to hubs, departure delays may cause them to miss their connecting flight.[138]

c. Use of the Expanded Juliet Pad Presents Aviation Safety and Operational Challenges.

In addition to unacceptable congestion and delay, the Expanded Juliet Pad scenario presents the following aviation safety and operational issues:

- Only mobile/portable deicing equipment could be used for deicing at the Expanded Juliet Pad, because the FAA requires RSAs to be kept free of all permanent objects except those objects that need to be located in the RSA based on their function. Deicing equipment is not classified as vital to runway function so could not be located within the Runway 14-32 RSA.

  The use of mobile/portable equipment only for deicing at the Expanded Juliet Pad would cause substantial logistical and delay problems and make the deicing process at the Expanded Juliet Pad less efficient compared to the conceptual North or East Pads or to existing permanently fixed centralized deicing pads such as those at Pittsburgh International, Denver International and Dulles International Airports (these airports, which are not subject to the same space constraints as Logan, were able to locate their centralized deicing pads sufficiently far away from their departure runways to allow permanent structures).

  For example, permanent storage tanks for unmixed deicing fluid and water could not be located at the Expanded Juliet Pad because the Runway 14/32 RSA must be kept free and clear of equipment. Remote location of these tanks would increase deicing truck cycle time and slow down the deicing process because deicing trucks would have to leave the pad to refill. Moreover, any time the FAA required the opening of any of the runways incompatible with the use of the pad, all aircraft, vehicles, equipment, and other objects would have to be immediately removed from the pad. If the pad could not be cleared in the necessary time, disruption of air traffic control and safety concerns would result. For example, without fixed storage tanks for water and deicing fluids, deicing vehicles would have to leave the pad to refill their tanks, resulting in delays and increased congestion (which in turn poses safety and runway/taxiway incursion concerns). Also, given Boston-Logan's space constraints,

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138 *See id*.

it would be difficult to find a location near the pad to store all of the mobile equipment.[139]

- Taxiway J and Runway 14 would have to operate as taxilanes during deicing operations.

- Due to space constraints, Taxiway J northwest of Deicing Position 8 would be restricted to Group III or smaller aircraft taxiing to Deicing Positions 1 through 7, and Deicing Position 1 through 7 would be limited to Group III or smaller aircraft.

- Due to space constraints, the vehicle service road between Runway 14-32 and the Boston Harbor (i.e., the perimeter road) would be temporarily closed to traffic when a Group IV aircraft taxied to Deicing Position 8.

- The Expanded Juliet Pad area would be designated as a non-movement area (i.e, not under direct Air Traffic Control Tower control) during deicing operations, which would allow for closer spacing of the aircraft deicing position centerlines in accordance with Table 3-1 of FAA Advisory Circular 150/5300-14B, *Design of Aircraft Deicing Facilities*.

- The Expanded Juliet Pad would require a snow storage area. However, the northwest end of the pad would be the only available area where Massport equipment could place snow removed from the rest of the pad. As a result, Deicing Position 1 would be lost to additional snow storage if the amount of snow accumulation on the pad required it.[140]

- The Amelia Earhart Terminal is located just across Taxiway Juliet from deicing positions 8 and 9. This terminal was previously occupied by FBO Signature Flight Support, then American Eagle Airlines. It is currently used as a contingency facility for unscheduled operations such as international diversions, bomb threat aircraft and humanitarian flight missions. Both the Earhart Terminal and the aircraft ramp along Taxiway Juliet are expected to be used on a regular, full-time basis again in the future. It is most likely that, due to gate constraints at Boston-Logan Airport, a regional airline would be relocated to the Earhart Terminal. This would require direct and unimpeded access to and from the Terminal by aircraft, as well as ramp enplaning and deplaning of passengers. The latter could pose a health and safety risk for passengers exposed to major deicing operations in close proximity.

- Some of the marking required to delineate taxi paths and deicing positions on the Expanded Juliet Pad would conflict with FAA requirements regarding runway and taxiway marking. Boston-Logan would have to use temporary markings or obtain a modification from the FAA.[141]

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139 *See id.*; *see also* CH2M HILL Deicing Pad Report at pp. 11-12.
140 *See* CH2M HILL Deicing Pad Report at pp. 11-12.
141 *See* Ishihara Affidavit, ¶ 23.

E. Boston-Logan Does Not Have Space to Store The Deicing Runoff From An Expanded Juliet Pad.

Even if the Expanded Juliet Pad did not present the host of operational problems described above, it would still be unworkable because there is no available, usable space at Boston-Logan in which to locate the storage capacity that Boston-Logan would need to comply with the Proposed Rule's requirement for 60% collection of spent available ADF using a centralized deicing pad. As illustrated in Figure 3A above, there is only one small, inadequately sized area at Boston-Logan that is available for deicing runoff storage.

Massport engaged a leading wastewater engineering firm, Camp, Dresser & McKee Inc. ("CDM"), to estimate how much deicing runoff would be generated and require collection from the use of the conceptual Expanded Juliet Pad for 100% throughput of all aircraft departing Boston-Logan during deicing conditions (as the Proposed Rule would require[142]), and how much storage capacity would be needed to store this total amount of deicing runoff prior to treatment and disposal.[143] Using its Airport Deicing Management Model ("ADMM") – which was developed in conjunction with the FAA and is used at airports nationwide – CDM determined that Boston-Logan would need approximately 4.3 million gallons of storage capacity to store the deicing runoff from Expanded Juliet Pad under the Proposed Rule.[144] Moreover, to store this amount of runoff, Boston-Logan would need to find room at the already space-constrained Boston-Logan for three 1.8 million gallon aboveground storage tanks (like those at the Boston-Logan fuel tank facility).[145] There is no such room at the Airport.

To develop its storage capacity estimate, CDM first simulated ADF usage at Boston-Logan over the range of weather conditions experienced at the Airport during the winter deicing

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142 This was a simplifying assumption due to the complexity of accounting for the necessary closures of Expanded Juliet Pad in some conditions.

143 *See generally* "Deicing Runoff Storage Analysis, Boston Logan Airport, Massachusetts Port Authority," prepared by CDM, dated February 2010 (hereinafter "CDM Report") (attached hereto as Exhibit 5).

144 *See id.* at p. 2-5. Sampling for the 2009 Boston-Logan Water Quality Study found that approximately 50% of applied ADF was lost between application and the outfall discharge, presumably through fugitive loss mechanisms such as evaporation and biological degradation. Therefore, CDM assumed that 100% of ADF-containing stormwater would have to be collected to comply with the Proposed Rule. For airports such as Boston-Logan, the Proposed Rule requires collection of 60% of available ADF, and EPA assumes that available ADF is 80% of applied ADF. Therefore, under the Proposed Rule, 48% (60% of 80%) of applied ADF must be collected. *See id.* at pp. 1-6 – 1-7. (Note that EPA's definition of available ADF is what falls to the deicing pad, so CDM's finding that only 50% of applied ADF reaches the end of the collection system is not inconsistent with EPA's assumption of 80% availability.)

145 *See id.* at p. 2-10. In addition, EPA should note that the estimates generated by CDM's "single design deicing season representing a maximum storage needs scenario" may not provide the maximum storage capacity that would ensure 100% compliance with the Proposed Rule. The Proposed Rule does not have a "design storm" event threshold, which means that Boston-Logan would be responsible for ensuring storage for deicing seasons that may exceed the CDM model season. The lack of a design storm could lead to the over-sizing of all storage and treatment parameters, adding unnecessary cost and space utilization obligations. Nonetheless, the CDM Report provides a realistic storage analysis that represents the *minimum* storage that would be required to implement the Proposed Rule, and that demonstrates that complying with the Proposed Rule would be impossible. Since issuing the Proposed Rule, EPA has promulgated ELG standards for the construction and development source category that rely on a two-year/24-hour design storm standard for treatment. *See* 40 C.F.R. § 450.22(b); *see also* 74 Fed. Reg. 62,996, 63,049 (Dec. 1, 2009).

seasons from October 1948 through April 2009 (using hourly precipitation, daily snowfall and daily temperature data from Boston-Logan, and assuming current operations and departure schedules).[146] It then identified a single design deicing season representing a maximum storage needs scenario, and used the ADMM to quantify the deicing runoff volume and the biological oxygen demand ("BOD") mass that would accumulate in hypothetical storage tanks during this modeled deicing season.[147] Finally, based on this design season modeling, CDM quantified the required storage volumes, BOD load capture and flow capture that would be necessary to meet the requirements of the Proposed Rule.[148]

CDM's modeling analysis used the total area estimate developed by CH2M HILL in its analysis of the conceptual Expanded Juliet Pad – 25.4 acres, all impervious – and assumed, as would be required by the Proposed Rule, that all aircraft departing Boston-Logan during deicing conditions would be deiced on this pad.[149] Based on its modeling, CDM concluded that to collect and store all of the deicing runoff from Expanded Juliet Pad, Boston-Logan would need approximately 4.3 million gallons of storage capacity.[150]

CDM further concluded that if this runoff were stored in aboveground tanks with a storage capacity of 1.8 million gallons, similar to the aboveground fuel storage tanks installed at Boston-Logan in 1997-1998, Boston-Logan would need to find room for three such tanks.[151] As detailed in the Affidavit of Richard Bessom, the Program Manager for Horizontal Projects at Massport, based on his experience overseeing the design and construction of Boston-Logan's aboveground fuel storage tank facility[152] and his knowledge of Boston-Logan, it would not be feasible to site aboveground storage tanks of this volume at Boston-Logan without displacing an existing or planned airport-related function located on-site; there is no available space on the

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146 *See* CDM Report at pp. 1-1 – 1-7.

147 *See id.* at pp. 1-7 – 1-12.

148 *See id.* at pp. 2-1 – 2-9. In this part of its analysis, CDM simulated the disposal of deicing runoff from the two hypothetical storage tanks to the MWRA's Deer Island Treatment Plant, assuming that each storage tank would discharge each day at maximum rates of 32.5 million gallons of deicing runoff per day and 33,000 pounds of BOD per day. *See id.* at p. 1-4. These assumptions were based on informal consultations between Massport and the MWRA; the MWRA has not indicated that it could or would accept such discharges from Boston-Logan, and further discussions between Massport and the MWRA would be necessary to determine whether such discharges would be feasible, and if so, at what cost to Massport. *See id.*

Gresham Smith & Partners used the result of this daily flow and BOD load modeling in its evaluation of the feasibility of using anaerobic fluidized bed treatment systems to treat all of the deicing runoff collected from Boston-Logan's 60% collection efforts, as would be required by the Proposed Rule. *See* Section VI below.

The total design season volume of deicing runoff from the conceptual Expanded Pad Juliet that CDM estimated would require treatment and disposal would be 19.1 million gallons. *See* CDM Report at p. 2-5.

149 *See id.*

150 *See id.* CDM also considered the three-pad scenario – deicing runoff collection at the North Pad, East Pad and Expanded Juliet Pad – but did not evaluate this scenario in detail. Based on the presumption that deicing of all departing aircraft would occur at one of these pads, based on wind direction and weather conditions, the total deicing runoff load generated would be the same. However, the aggregate required storage volume would be greater under the three-pad scenario than with the Expanded Juliet Pad as the sole centralized deicing pad. *See id.*

151 *See id.* at p. 2-10.

152 This 1997-1998 project consisted of the construction of four above-ground pile-supported storage tanks, each tank capable of storing 1.8 million of fuel, for a total storage capacity of 7,218,960 gallons. Collocated with the storage facility is a small one-story operations and control building to monitor the product levels and provide testing. There are also two offloading facilities where tankers can deliver product to the tank farm and offload into the above ground tanks. *See* Bessom Affidavit, ¶ 3.

landside portion of the Airport shown in Figure 3A.[153] Even if it were feasible to construct an aboveground tank farm to store 4.3 million gallons of deicing runoff at Boston-Logan, the cost would be about $28 million, based on the cost of building the Airport's fuel storage tank facility.[154] Moreover, according to Mr. Bessom, constructing underground storage tanks would be an enormous engineering challenge, in part because of the high water table at Boston-Logan, and would result in the displacement of the airport functions conducted aboveground at the particular location for the duration of construction.[155] In addition, the costs of constructing underground tanks would be exorbitant, potentially hundreds of millions of dollars.[156]

One potential alternative to centralized deicing pads – at-the-gate deicing coupled with collection of deicing runoff from all affected drainage outfalls ("end-of-pipe interception") – also would be unworkable at Boston-Logan. The volume of stormwater runoff from Boston-Logan that would need to be collected and stored would be monumental. Using this alternative ADF collection approach at Boston-Logan would allow for the current practice of individual airline deicing at the gates to continue but would require the interception of all the deicing runoff from the North and West Outfalls for storage, treatment and disposal. However, given that deicing at Boston-Logan occurs at a number of terminals spread across a large area, the volume of stormwater that would need to be collected and stored for treatment is enormous. CDM determined that this collection and storage option would require Boston-Logan to site and build approximately 94.2 million gallons of storage capacity, or fifty-two (52) 1.8 million gallon aboveground storage tanks.[157] Given the infeasibility of siting just three additional 1.8 million gallon tanks at Boston-Logan as documented in Richard Bessom's Affidavit, siting over 52 new 1.8 million gallon tanks at or near Boston-Logan is simply inconceivable.[158] Even if it were feasible, construction of an aboveground tank farm for storage of 94.2 million gallons of deicing runoff would likely cost in excess of $600 million.[159]

VI. The Proposed Rule Inappropriately Mandates the Use of Anaerobic Fluidized Bed Systems as BAT for ADF Treatment.

The Proposed Rule establishes anaerobic fluidized bed ("AFB") systems as the model BAT for the treatment of deicing runoff to reduce chemical oxygen demand ("COD"). Setting aside the fact that, as discussed in Section V.E. above, it would not be feasible for Boston-Logan

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153 *See id.,* ¶¶4- 6. In this position, Mr. Bessom supervises six Project Managers in the Massport Capital Programs and Environmental Affairs Department who manage the design and construction of "horizontal" capital projects at Boston-Logan such as runways, roads, utilities and storage yards. *See id*., ¶ 1. He has served in this role for Massport for four years. *See id*. From 1985 until he began this position, Mr. Bessom was a Project Manager in the same department, managing design and construction projects. *See id*.

154 *See id*., ¶ 10. Costs to construct the aboveground fuel storage tank facility in 1997-1998 totaled about $27,000,000, which would be about $47,000,000 in 2010 dollars (using a 4% escalation factor). *See id*. The $28 million cost estimate does not include any treatment facility or any underground distribution piping to a treatment facility or from a deicing area. *See id.*

155 *See id*., ¶ 6.

156 *See id*.

157 *See* CDM Report at pp. 2-5, 2-10. The total design season volume of deicing runoff from the end-of-pipe interception option that CDM estimated would require treatment and disposal would be 391.6 million gallons. *See id*. at p. 2-5.

158 *See* Bessom Affidavit, ¶ 7.

159 *See id.,* ¶ 10.

to store the enormous volume of stormwater runoff for treatment, it also would be neither feasible nor cost-effective for Boston-Logan to treat its deicing runoff on-site using an AFB system. First, an AFB system would not be technologically capable of treating all of the highly concentrated deicing runoff that would be collected from the conceptual Expanded Juliet Pad, or all of the very dilute runoff that would be collected in the alternative ADF collection scenario of end-of pipe interception (*i.e.,* at-the-gate deicing with collection of deicing runoff from the North and West Outfalls). Second, the costs of installing an AFB system at Boston-Logan would be unreasonably high, especially in light of the minimal environmental benefit. Finally, as with centralized deicing pads, siting AFB systems requires a sufficient amount of available, usable land, which at space-constrained airports like Boston-Logan is in insufficient supply or altogether unavailable.

Massport engaged aviation deicer management and treatment specialists Gresham Smith & Partners ("GS&P") to evaluate the feasibility of using an AFB system to treat deicing runoff under two scenarios: (1) treating the projected volume of deicing runoff from the conceptual Expanded Juliet Pad, and (2) treating the projected volume of deicing runoff that would result from implementing the end-of-pipe interception scenario.[160] GS&P concluded that it would not be feasible to treat all deicing runoff at Boston-Logan under either scenario. On one hand, the Expanded Juliet Pad runoff would be too concentrated for an AFB system to treat, and on the other hand, the "end-of-pipe" runoff would be too dilute.[161]

In its storage analysis, CDM estimated that on a design season basis, the conceptual Expanded Juliet Pad would generate about 19.1 million gallons of deicing runoff, with biological oxygen demand ("BOD") concentrations ranging from zero to the extremely high concentration of 500,000 milligrams per liter ("mg/L").[162] GS&P determined that as a result, Boston-Logan would need an AFB system capable of treating approximately 33,000 pounds of BOD per day. According to GS&P, while an AFB system could be designed to treat such an extremely high daily load rate, such a system would experience major operational problems.[163] Moreover, building such a system at Boston-Logan would cost about $54 million (not including such key components as storage facilities, and piping from these facilities to the treatment system) and would require approximately six acres of land at Boston-Logan.[164] As detailed in the Affidavit of Richard Bessom, it would be infeasible to build such a treatment system at Boston-Logan because of the Airport's extreme space constraints.[165]

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160 *See* "Boston-Logan International Airport, AFB Treatment Applicability Review," prepared by GS&P, dated February 2010 (hereinafter "GS&P Report") (attached hereto as Exhibit 6) at pp. 1, 2. GS&P used the results from CDM's modeling efforts as the input for its analysis. *See id.* at p. 2.

161 *See id*. at p. 1.

162 *See id*. at p. 3.

163 *See id*. Specifically, AFB systems are designed to operate at a nearly constant daily BOD loading rate. Because deicing runoff concentrations can be highly variable, any AFB system operated at an airport would have to adjust influent flow rates to achieve this necessary constant loading rate. The lower the concentration of ADF in influent, the higher the necessary flow rate. Conversely, the higher the concentration of ADF in the influent, the lower the necessary flow rate to maintain a constant loading rate. Given this, treatment of the deicing runoff collected from Expanded Pad Juliet, with its very high ADF concentrations, would require very low flow rates into any AFB system. *See id.*

164 *See id*. at pp. 5-6.

165 *See* Bessom Affidavit at ¶ 8.

Finally, even with a $54 million AFB system, Boston-Logan would still have to send a percentage of its deicing runoff off-site for treatment because of limitations on the concentrations of BOD that the system could treat.[166] One theoretical option for satisfying the Proposed Rule's treatment requirements would be slow metering of the concentrated runoff collected from Expanded Juliet Pad to a publicly owned treatment works ("POTW") such as the MWRA's Deer Island Treatment Plant. However, a POTW may be prohibited from accepting runoff with such high concentrations of BOD. Moreover, if the runoff were allowed to be metered to the POTW, additional storage would be required to hold that runoff before discharge, and the size of that storage would be dependent on the POTW's load limits. This additional storage and discharge to the POTW would also incur additional capital and operational costs and require additional land space.[167]

With regard to the end-of-pipe interception collection scenario, CDM estimated that on a design season basis, end-of-pipe interception would generate about 391.6 million gallons of deicing runoff, with BOD concentrations ranging from zero to 80,000 mg/L BOD. GS&P determined that as a result, under this scenario, Boston-Logan would need an AFB capable of treating approximately 38,000 pounds of BOD per day. According to GS&P, while an AFB system could be designed to treat this daily load rate, the high volumes of runoff in combination with the very low predicted BOD concentrations occurring often during the design season would present a different but nonetheless significant set of operational problems than treatment of the very high BOD concentrations predicted in the Expanded Juliet Pad scenario.[168] Moreover, building such a system at Boston-Logan would cost about $61 million (again, not including such key components as storage facilities and piping) and would require approximately six acres of land at Boston-Logan.[169] As noted above, it would be infeasible to such a treatment system at Boston-Logan because of the Airport's extreme space constraints.

Finally, GS&P's analysis of CDM's simulated flows and loads for the end-of-pipe collection scenario shows that this $61 million AFB system could treat approximately 75% of the total annual BOD load but only about 15% of the annual deicing runoff volume. The remaining

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[166] *See* GS&P Report at pp. 4, 6. GS&P's analysis of the simulated daily flows and BOD loads from CDM's modeling of the Expanded Pad Juliet collection scenario show that during the design season, over 1.2 million gallons of runoff (6% of the total annual runoff, containing 56% of the BOD load for the design season) would have concentrations greater than 75,000 mg/L BOD. BOD concentrations in AFB system influent above 75,000 mg/L BOD causes operational concerns relating to the removal of solids that are produced as a by-product of the AFB treatment process. As a result, only about 94% of the deicing runoff volume, and only about 44% of the annual BOD load, from the conceptual Expanded Pad Juliet could be feasibly treated by an AFB system. *See id.* at pp. 3, 4.

[167] *See id.* at p. 6. GS&P was not tasked with providing preliminary opinions of cost for the three-pad scenario. It nonetheless has noted that this scenario would likely result in higher volumes of deicing runoff being collected as well as a higher volume of runoff and COD or BOD load at concentrations within the acceptable COD or BOD concentration range for on-site AFB treatment. According to GS&P, it is therefore highly likely that the costs for on-site AFB treatment for the three-pad scenario would be at least equal to and possibly even higher than the costs for the Expanded Juliet Pad alone. *See id.* at p. 7.

[168] *See id.* As discussed above, because AFB systems operate at a nearly constant BOD loading rate, the influent flow rate is dependent on the influent concentration. As the influent concentration decreases, the influent flow rate must increase to feed the same daily load to the system. At low concentrations (less than 1,200 mg/L BOD) the necessary influent flow rate to the AFB treatment system becomes too high to support efficient operation of the system. Also, the amount of methane generated by the anaerobic treatment would not be sufficient to supply the heat requirement to sustain the temperature required. *See id.*

[169] *See id.* at pp. 6-7.

85% of runoff volume (approximately 331 million gallons per season) would have concentrations of less than 1,200 mg/L BOD, meaning that it could not feasibly be treated by an AFB system. As a result, as under the Expanded Juliet Pad runoff treatment scenario, an additional treatment option would be necessary. One theoretical option would be to discharge the low concentration runoff to a POTW such as the MWRA's Deer Island facility. However, this option would likely have significant cost implications. Moreover, high-volume deicing runoff events at Boston-Logan typically coincide with high precipitation events, and a POTW may not accept high volumes from Boston-Logan during and shortly after precipitation events, when the POTW's own system may already be near capacity. In this event, Boston-Logan would be required to hold large volumes of runoff and meter it to the POTW, which would necessitate even greater storage and additional costs.[170]

In short, it would not be either feasible or, assuming feasibility, cost-effective to use an AFB system at Boston-Logan to treat deicing runoff, as EPA has proposed. Boston-Logan does not have available, usable land to accommodate either the storage capacity that would be needed for the enormous volume of deicing runoff that would require treatment under the Proposed Rule, or the projected six-acre AFB system itself. In addition, even if Boston-Logan could find room for such a system at Boston-Logan, AFB treatment would be an inappropriate selection as a treatment technology for Boston-Logan's deicing runoff, because it would not be capable of treating all of the highly concentrated deicing runoff that would be collected under the Expanded Juliet Pad scenario, or all of the very dilute runoff that would be collected under the alternative end-of pipe interception scenario. Finally, the costs of installing an AFB system at Boston-Logan would be unreasonably high, especially in light of the minimal environmental benefit.[171]

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170 *See id.* at pp. 5, 6-7.

171 GS&P also identified three fundamental flaws in EPA's analysis of AFB treatment and proposal of numeric COD limits that have negative implications for Boston-Logan. First, EPA did not state whether the basis for those numeric limits is Total COD or Soluble COD. If EPA intends airports covered by the Proposed Rule to meet a Total COD limit (and otherwise assuming that AFB treatment would be feasible at Boston-Logan), Massport would have to incur significant additional costs to install a solids handling system. This is due to the fact that the high concentrations of deicer in Boston-Logan's deicing runoff would require significant solids removal to meet Total COD limits. *See id.* at pp. 7-9.

Second, in establishing the proposed COD limits, EPA made at least two inaccurate simplifying assumptions regarding AFB treatment systems: (1) that there is no relationship between treatment influent characteristics and effluent concentrations, and that (2) the AFB treatment system effluent data on which EPA relied (from the existing AFB treatment system at Albany International Airport) represents enough of a range of deicing, operating and compliance conditions to be representative of the model technology. According to GS&P, an AFB treatment system at Boston-Logan is not expected to operate under the same circumstances as the AFB system at Albany, with the result that the COD concentrations in a Boston-Logan AFB treatment system's effluent may be higher than the COD limit in the Proposed Rule. *See id.* at pp. 9-14. Finally, the Proposed Rule does not contain any compliance exception for when an AFB system is properly operated but still exceeds the proposed COD limits. *See id.* at p. 14.

The GS&P Report demonstrates many of the fundamental flaws in EPA's analyses that undermine the Agency's conclusion that AFB is a "model" BAT treatment system or that such systems can achieve EPA's effluent standard with the consistency necessary to maintain compliance. Alternative treatment systems also would not provide Boston-Logan with potential treatment options, for many of the same reasons why an AFB system is not an option (*e.g.*, lack of storage capacity, space to construct a system, cost relative to benefits, etc.). Therefore, while EPA may assert that it does not mandate its "model" technology, there are no scenarios under which any treatment technology is "available" to Boston-Logan that would lead to compliance with the Proposed Rule's treatment standards.

VII. The Proposed Rule Inappropriately Mandates BOS to Incur Compliance Costs That Are Disproportionately Higher Than EPA's Projected Compliance Costs

A. EPA's Cost Estimates Are Flawed and Grossly Underestimated as Applied to Boston-Logan.

The cost estimates upon which EPA based its Proposed Rule are fundamentally flawed, particularly as applied to Boston-Logan. First, they were based on extremely limited and unrepresentative data. For example:

- deicing pad costs were based on information from three airports;[172]
- storage tank costs were based on information from three airports;[173]
- storage tank volumes were based on information from three airports (only one of which also provided tank cost data);[174]
- AFB costs were based on information from two airports;[175] and
- piping costs were not based on information from any airports.[176]

EPA then used rudimentary and inaccurate conversion factors to apply these costs to other airports covered by the Proposed Rule. For example, deicing pad costs were normalized to deicing season aircraft departures.[177] However, deicing pad size and location is in fact determined by deicing season peak hour departures and fleet mix, as detailed in the CH2M HILL Deicing Pad Report as well as weather patterns and runway usage.[178] Further, deicing pads of similar size in different locations can have very different costs of construction, due to factors such as the suitability of the existing base material.[179]

Second, storage tank costs were normalized to tank volume, again ignoring site-specific factors such as space constraints.[180] Storage tank volume was normalized to annual aircraft departures.[181] However, the volume of storage required is related to deicing season departures, as well as the magnitude of deicing events, the amount of precipitation, and the rate at which flow and load can be discharged to treatment facilities.[182] Third, AFB costs were normalized to

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172 Technical Development Document at p. 11-17.
173 *Id*. at p. 11-28.
174 *Id*. at p. 11-28.
175 *Id*. at p. 11-23.
176 *Id*. at p. 11-26.
177 *Id*. at p. 11-17.
178 *See* CH2M Hill Deicing Pad Report at pp. 3-6, 7.
179 *See id.*at 13-14.
180 Technical Development Document at p. 11-28.
181 *Id*. at p. 11-28.
182 *See generally* CDM Report. *See also* ERG, Estimated Capital and Operating Costs for Storage Tanks, EPA-HQ-OW-2004-0038-0853, at 1 (noting that tank capacity is based in part on flow and load).

COD load;[183] this calculation omits the other key variable, which is flow.[184] Finally, piping costs were assumed to be the same for all airports, based on an arbitrary assumption that each airport would require 1,000 linear feet of piping.[185] No information is provided to support this assumption.[186]

EPA appears to have made a number of significant errors in its calculations with respect to its Boston-Logan-specific estimates. For example, the Technical Development Document states that EPA normalized deicing pad costs to deicing season takeoffs, then translated the costs to other airports using deicing season takeoffs at those airports.[187] However, the numbers EPA used to normalize costs are for annual departures, not deicing season departures.[188] Thus, extrapolating the normalized costs by multiplying them by deicing season departures at other airports (typically less than half of annual departures) results in a gross underestimate (see Table B). In addition, EPA's calculations for the capital costs of AFB treatment are significantly flawed; the numbers presented for Boston-Logan are not the results obtained using EPA's stated equation (see Table B and Exhibit 9). Finally, in its calculation of storage tank costs, EPA's Cost Annualization Model Spreadsheet shows scaling factors of 0.33 and 0.66 with no explanation.[189] The 0.33 scaling factor appears to have been applied to Boston-Logan (see Table B and Exhibit 9). After EPA's cost estimates for Boston-Logan are revised to account for these errors, EPA's total cost estimate jumps from $73 million to $157 million. These results are shown in the third column of Table B below. Yet, even the higher, corrected EPA estimate of $157 million grossly underestimates Massport's actual compliance costs, as summarized below.

B. Boston-Logan's Estimated Costs Are Dramatically Higher Than EPA's Estimates.

In addition to the discrepancies noted above and in Table B, EPA's cost estimates fundamentally fail to account for key factors that drive Boston-Logan's costs to be dramatically more than EPA projected. Massport's experts recalculated the costs to comply with the Proposed Rule taking these essential factors into account. This results in a total cost estimate of over $1.65 billion for the three-pad scenario, which is 22 times EPA's estimate (see Table B below). As documented herein, there are several key reasons for this enormous cost. First, the deicing pads constructed under the three-pad scenario (if they could be permitted) would be orders of magnitude more costly due to the exorbitant costs of creating filled land, as described above in Section V.C.2. Second, storage tanks will be far more costly due to site-specific costs of construction, based on Massport's experience in constructing four fuel tanks in 1997-1998, as described in Section V.E. Finally, the AFB treatment costs will be much higher because Boston-

183 Technical Development Document at p. 11-23.
184 *See generally* GS&P Report.
185 Technical Development Document at p. 11-26.
186 Because EPA's underlying economic analyses are fundamentally flawed and lacks key considerations directly relevant to airport operations and deicing, it should reassess the economic costs and benefits before proceeding with this rulemaking.
187 Technical Development Document at 11-17.
188 ERG, Estimated Capital and O&M Costs for Centralized Deicing Pads, EPA-HQ-OW-2004-0038-0845, at 2.
189 EPA, Cost Annualization Model, EPA-HQ-OW-2004-0038-0634.

Logan will not be able to treat a significant portion of deicing runoff with AFB, as discussed in Section VI. Table B shows the differences between EPA's estimated costs and Boston-Logan's estimated costs.

Table B: Estimates of Capital Costs for BAT Installation (CDP + AFB)

Item	EPA-Estimated Cost ("NPV")[1]	EPA-Estimated Cost (2006$)[2]	EPA-Estimated Cost With Errors Corrected (2006$)	Massport's Estimated Costs (in 2010$)		
				3-Pad Scenario	Juliet Pad Scenario	End-of-Pipe Scenario
Deicing Pad	$23,904,619	$23,208,368	$55,700,083	$1.57 billion	$22.3 million for severely undersized pad that cannot be used under all wind conditions	Not Applicable
Storage Tank	$2,412,299	$7,097,086	$7,097,086	At least $28 million	$28 million	$600+ million
Piping	$517,437	$502,366	$502,366*	$502,366*	$502,366*	$502,366*
AFB Treatment	$45,795,136	$44,461,297	$93,722,677	At least $53.5 million	$53.5 million for system to treat 94% of annual runoff volume, 56% of BOD load	$61.2 million for system to treat 15% of annual runoff volume, 75% of BOD load
Monitoring	$798,160	$223,432	$223,432*	$223,432*	$223,432*	$223,432*
Other Factors				Does not account for substantial mitigation costs	$167.1 million (delay costs over 10 years in high scenario)	
Total	**$73,427,651[3]**	**$75,492,549**	**$157,245,644**	**$1.65+ billion**	**$271.6 million**	**$662+ million**

Notes:
[1] EPA summarizes annualized costs per airport at Table 11-1 of the Technical Development Document for Proposed Effluent Limitation Guidelines and Standards for the Airport Deicing Category. The estimates used to arrive at the figures in Table 11-1 are reflected in this column are based on the net present value ("NPV") of estimated costs in 2006 dollars.
[2] This column provides EPA's cost estimates without net present valuation for comparison with Massport's corrected estimates in the column to the right.
[3] This estimate reflects EPA's estimate of non-annualized capital costs. Table 11-1 (see footnote 1) presents an annualized estimate.
*This estimate reflects EPA's estimate and has not been independently calculated by Massport. Boston-Logan's costs would likely be much higher.

VIII. If EPA Finalizes the Proposed Rule in Its Current Form, Boston-Logan Is Entitled to a Fundamentally Different Factors ("FDF") Variance under CWA § 301(n).

Section § 301(n) of the Clean Water Act authorizes EPA to grant individual dischargers a variance providing for effluent limitations that are less stringent than those required by ELGs promulgated under CWA §§ 301 and 304, upon a showing by the discharger that its facility is "fundamentally different with respect to the factors (other than cost) specified in [CWA § 304(b)] and considered by the Administrator in establishing such national effluent limitation guidelines."[190] EPA has identified six factors that "may be considered fundamentally different" under CWA § 301(n), including "land availability, and configuration as they relate to the discharger's equipment or facilities," "[c]ost of compliance with required control technology," and "[n]on-water quality environmental impact of control and treatment of the discharger's raw waste load."[191] As documented in this comment letter and attached materials, Boston-Logan's severe space constraints, and the extremely high costs (in excess of $1.57 billion) that Massport would have to incur to build sufficient centralized deicing pad capacity to comply with both the Proposed Rule and applicable FAA requirements clearly constitute factors relating to Boston-Logan that are "fundamentally different" from the factors considered by EPA in the development of the Proposed Rule.[192]

A. Boston-Logan's Severe Space Constraints Would Constitute a Fundamentally Different Factor Requiring an FDF Variance.

The lack of available land for additional development or expansion at Boston-Logan makes it impossible for Massport to site or build enough centralized deicing pad or deicing runoff storage or treatment capacity to be able to comply with the Proposed Rule. If EPA promulgates a final rule that requires centralized deicing pads as BAT for spent ADF collection, Boston-Logan will have a compelling case for an FDF variance, because Boston-Logan's "land availability, and configuration as they relate to [its] equipment or facilities" will constitute, in the words of the United States Supreme Court, a "relevant factor[]" that was not "taken sufficiently

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[190] 33 U.S.C. § 1311(n)(1)(A). Congress added § 301(n) in 1987 to codify EPA's preexisting FDF variance procedure. In adding the new language, Congress emphasized that the FDF variance serves as "a 'safety valve' to the categorical statutory scheme, allowing EPA to address plant-specific variations through a separate administrative process outside of national rulemaking." *Chemical Manufacturer's Ass'n v. EPA*, 870 F.2d 177, 222 (5th Cir. 1989 (citing H.R.Rep. No. 189, 99th Cong., 1st Sess. 26 (1985).

[191] 40 C.F.R. § 125.31(d)(3), (5), (6). In addition, EPA may grant an FDF variance only if compliance with the national limits would result in either (a) "[a] removal cost wholly out of proportion to the removal cost considered during development of the national limits," or (b) "[a] non-water quality environmental impact (including energy requirements) fundamentally more adverse than the impact considered during development of the national limits." *Id*. § 125.31(b)(3).

[192] In order to qualify for an FDF variance, a discharger's variance application must be "based solely on information and supporting data submitted to the Administrator during rulemaking" (or "information and supporting data the applicant did not have a reasonable opportunity to submit during such rulemaking"). 33 U.S.C. § 1311(n)(1)(B)(i), (ii). Massport believes that this comment letter and all of the information and supporting data submitted to EPA herewith provide more than sufficient grounds for EPA to grant Boston-Logan an FDF variance if requested. Massport nonetheless reserves its right to submit additional information and supporting data to EPA in accordance with applicable law.

into account in [EPA's] framing that requirement originally, and that … properly considered, would have justified – indeed, required – the creation of a subcategory" for airports as space-constrained as Boston-Logan.[193] In short, if EPA issues such a final rule, its granting an FDF variance to Boston-Logan will be the only means by which it will be able "to remedy categories which were not accurately drawn because information was either not available to or not considered by the Administrator in setting the original categories and limitations."[194]

EPA asserts that it considered whether to establish a separate subcategory within the Airport Deicing Category based on "availability of land to install collection systems," and determined that such a subcategory is unnecessary because "EPA's analysis indicates that airports have sufficient land to install deicing pads."[195] However, the only document in the Administrative Record Docket for the Proposed Rule that may reasonably be described as an "analysis" that relates to "availability of land to install collection systems" is the February 7, 2008 memorandum from ERG to EPA entitled "Estimated Deicing Pad Areas and Deicing Pad Space Evaluation" (the "ERG Memorandum").[196] Instead of taking a technically grounded approach to the sizing and siting of centralized deicing pads at airports that may have prohibitive space constraints, the ERG Memorandum is based on an overly simplistic, and ultimately technically indefensible, formula for determining the number and size of deicing pads. First, a single deicing pad will not suffice for the operational needs of airports with variable winds. In fact, EPA acknowledges that Pittsburgh, Denver, and Detroit Metro International Airports – those airports that EPA attests already can meet the Proposed Rule's spent ADF collection requirements through the use of centralized deicing pads – respectively rely on five, four and four such pads.

Second, ERG inappropriately tries to correlate the number of deicing pads necessary to the number of runways. As discussed in detail above in Section V.B, determining an appropriate number of deicing pads requires consideration of such site-specific factors as airfield layout, historical weather data and airport operations data regarding which runway use configurations are most commonly associated with snow and icing events. Such analyses are essential to effectively siting deicing pads near the runway ends that are most likely to be used by departing aircraft during snow and icing conditions.[197]

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193 *Chemical Mfrs. Ass'n v. Natural Resources Defense Council, Inc.,* 470 U.S. 116, 130 (1985).

194 *Id.*

195 74 Fed. Reg. at 44690, 44692.

196 A copy of the ERG Memorandum is in the Administrative Record Docket as Document No. DCN AD01240 (FDMS No. 1171).

197 Boston-Logan believes that EPA has only three options resulting from the analyses underlying its Proposed Rule and Boston-Logan's inability to comply with a final regulation based on the Proposed Rule: (1) withdraw the Proposed Rule; (2) repropose new airport deicing ELG standards after correcting all of the issues raised in these and other industry comments; or (3) grant a FDF variance for Boston-Logan. If EPA asserts it "properly considered" land availability issues through its ERG Memorandum (meaning it could not grant a FDF variance for Boston-Logan on a land availability basis), then the Airport would assert that a final regulation based on the Proposed Rule is arbitrary and capricious based on the obviously significant shortcomings associated with the ERG Memorandum. Conversely, if EPA agrees that the ERG Memorandum does not meet the "properly considered" standard, then it must grant Boston-Logan a FDF variance.

B. Boston-Logan's Extraordinarily High Costs to Achieve Compliance with the Proposed Rule Would Constitute a Fundamentally Different Factor Requiring an FDF Variance.

EPA's cost estimates grossly understate the costs that Boston-Logan would incur to meet the Proposed Rule's deicing runoff collection and treatment requirements at Boston-Logan. For example, EPA's original cost estimate for the construction of a centralized deicing pad or pads that would comply with the Proposed Rule was about $24 million. Corrected to account for calculation errors made by EPA (identified in Section VII.A), EPA's cost estimate for this proposed BAT for 60% available spent ADF collection at airports such as Boston-Logan would be about $55.7 million. However, to construct the three-pad scenario that could actually comply with both the Proposed Rule and FAA requirements, Massport would have to spend approximately **$1.57 billion**, and this amount does not include substantial necessary costs such as payments to the Commonwealth for use of public tidelands, environmental mitigation costs and permitting costs.[198]

More specifically, Boston-Logan's construction costs under the three-pad scenario (assuming the North and East Pads could be permitted) would be orders of magnitude more costly than EPA's estimate of the costs of ADF collection using centralized deicing pads, primarily due to the exorbitant costs of creating filled land in Boston Harbor, as described above in Section V.C.2. In addition, based on the costs that Boston-Logan incurred in 1997-1998 to construct four 1.8 million gallon fuel tanks at the Boston-Logan above-ground fuel storage facility, it is clear that building the storage capacity to manage all the deicing runoff collected at Boston-Logan under the Proposed Rule (assuming that space could be found at the Airport to site the necessary storage tanks) would be far more costly than what EPA has assumed (about $2.4 million, corrected to about $7 million) due to the site-specific factors described in Section V.E. Massport estimates the cost to build sufficient storage facilities at approximately $28 million.[199]

Finally, setting aside the unavailability of space at Boston-Logan to site an AFB treatment system, Boston-Logan's treatment costs would be much higher than EPA projected (about $45.7 million, corrected to about $93.7 million) because Boston-Logan would not be able to treat a significant portion of its deicing runoff using AFB treatment, as discussed in Section VI. As GS&P concluded, even if Massport expended $54 million to build an AFB system, it would only be capable of treating only 94% of the annual deicing runoff volume and only 56% of the associated BOD load under the Expanded Juliet Pad scenario, thereby leaving 6% of its runoff volume and 44% of the BOD load untreated. Treating this remaining portion would necessitate even more costs. Similarly, under the end-of-pipe interception scenario, even if Massport expended $61 million to build an AFB system, it would only be capable of treating only 15% of its annual deicing runoff volume and 75% of the associated BOD load. Again, Massport would still have additional costs to treat the bulk (85%) of its runoff volume and the remaining 25% of the associated BOD load.

198 *See* Section V.C.2.
199 *See* Bessom Affidavit , ¶ 10.

Clearly, the costs that Massport would incur to meet the Proposed Rule's ADF collection requirements alone would be "[a] removal cost wholly out of proportion to the removal cost considered during development of the national limits."[200]

IX. Conclusion

Based on the foregoing, the Proposed Rule fails to account for the unique conditions at Boston-Logan. These conditions include limited space, operational and safety constraints, and an unusually complex runway and taxiing system. As a result, it is not possible for Boston-Logan to comply fully with the Proposed Rule. Moreover, even partial compliance would impose enormous costs on Massport and airlines and cause unacceptable delays to the flying public. Finally, Massport is entitled to a variance in the event that EPA does not fundamentally revise the Proposed Rule.

[200] 40 C.F.R. § 125.31(b)(3).

List of Attachments

A. List of Tables

B. List of Figures

C. LIST OF EXHIBITS

1. Affidavit of David Ishihara

2. Affidavit of Richard Bessom

3. Affidavit of Stewart Dalzell

4. Analysis of Centralized Deicing Pad Feasibility of Logan International Airport (CH2M Hill, February 24, 2010)

5. Deicing Runoff Storage Analysis – Boston Logan Airport (Camp Dresser & McKee, February 2010)

6. Boston-Logan International Airport AFB Treatment Applicability Review (Gresham, Smith and Partners, February 2010)

7. Aircraft and Passenger Delay and Costs Resulting From Centralized Aircraft Deicing at Logan International Airport (SH&E, February 24, 2010)

8. Boston-Logan International Airport Deicing Pad Air Emissions Inventory (KB Environmental Sciences, February 17, 2010)

9. Analysis of EPA Cost Estimate for Boston-Logan

10. Water Quality Impacts of Deicing at Boston Logan International Airport (EA Engineering, Science, and Technology, September 30, 2009)

D. ADDITIONAL MATERIALS (ON ATTACHED DISKS)

VOLUME 1

1. Logan Airside Improvements Planning Project Supplemental Draft Environmental Impact Statement/ Final Environmental Impact Report (Massport and FAA, March 2001)

2. Logan Airside Improvements Planning Project Final Environmental Impact Statement (FAA, June 2002)

VOLUME 2

3. Comments of the Massachusetts Port Authority on the Draft NPDES Stormwater Permit for Logan International Airport (October 23, 2006)

4. U.S. Environmental Protection Agency, Region 1, Response to Comments on Draft NPDES Stormwater Permit for Logan International Airport (July 31, 2007)

5. U.S. Environmental Protection Agency, Region 1, Response to Comments on Draft NPDES Stormwater Permit for Logan International Airport (July 31, 2007)

6. Logan International Airport NPDES Stormwater Permit (July 31, 2007)

7. Logan International Airport NPDES Stormwater Permit (July 31, 2007) - Attachments

8. Logan International Airport Operations Stormwater Pollution Prevention Plan (Massport, Dec. 19, 2007, with updates)

9. Water Quality Impacts of Deicing at Boston Logan International Airport: Phase I Study Report (CH2M Hill)

10. Logan Airport Drainage Model – Calibration Update (CDM, October 2, 2009)

11. Boston-Logan International Airport 2008 Environmental Data Report (Massport, September 2009)

12. Microsoft Excel Files:

    a. Oct. 2008 - April 2009 Boston-Logan Airport Aircraft Operations

    b. Calculations for CDM and GS&P Reports (Exhibits 5 and 6) – Outfall Scenario

    c. Calculations for CDM and GS&P Reports (Exhibits 5 and 6) – Deicing Pad Scenario

Table 1: Airport Operations Per Acre, Major U.S. Airports Conducting Deicing[1]

Airport	Airport Acreage[2]	2008 Operations[3]	Operations per Acre
New York LaGuardia (LGA)	680	379,414	558
Chicago-Midway (MDW)	650	266,341	410
Reagan National (DCA)	861	277,298	322
Newark (EWR)	2,027	434,428	214
Philadelphia (PHL)	2,302	492,038	214
Boston (BOS)	**1,751**[4]	**371,604**	**212**
Atlanta (ATL)	4,700	978,824	208
Minneapolis (MSP)	2,930	450,044	154
Seattle (SEA)	2,500	345,242	138
Cleveland (CLE)	1,900	235,975	124
Chicago O'Hare(ORD)	7,627	881,566	116
Charlotte (CLT)	5,000	53,653	107
Memphis (MEM)	3,900	363,139	93
Baltimore Washington (BWI)	3,160	277,662	88
St. Louis (STL)	2,800	247,617	88
New York-JFK (JFK)	5,200	441,425	85
Portland (PDX)	3,000	252,572	84
Detroit (DTW)	6,400	462,520	72
Anchorage (ANC)	4,500	267,271	59
Houston International (IAH)	10,000	576,062	58
Salt Lake City (SLC)	7,700	389,321	51
Raleigh-Durham (RDU)	5,000	229,406	46
Cincinnati (CVG)	7,000	285,484	41
Dallas Fort Worth (DFW)	18,076	656,310	36
Washington-Dulles (IAD)	13,000	360,292	28
Indianapolis (IND)	7,700	197,202	26
Denver (DEN)	33,422	619,503	19
Kansas City (MCI)	10,200	176,717	17
Pittsburgh (PIT)	10,000	167,729	17
AVERAGE	**6,343**	**400,664**	**63**

[1] The listed airports include all of the airports listed in both the Top 50 U.S. Airports for ADF Usage (as listed in the EPA Technical Development Document for Proposed Effluent Limitation Guidelines and Standards for the Airport Deicing Category, Table 4-4 (2009)) and Airport Operations (as listed in Airports Council International, 2008 Final Traffic Count). Operations include aircraft landings and takeoffs.
[2] Source: Federal Aviation Administration Airport Master Record Forms (5010-1 & 5010-2). Available at http://gcr1.com/5010web/.
[3] Source: Airports Council International, 2008 Final Traffic Count.
[4] Source: Massport Survey Unit, February 22, 2010.

Table 2: Boston-Logan Airport Runway Statistics

Runway	Length (feet)	Notes
4L/22R	7,861	no jet departures allowed from 4L no jet arrivals allowed on 22R
4R/22L	10,005	4R has a Category III B Instrument Landing System
9/27	7,000	
14/32	5,000	only departures allowed from 14 only arrivals allowed on 32
15L/33R	2,557	
15R/33L	10,083	33L has a Category II Instrument Landing System

Table 3: Boston-Logan 2008 Runway Usage (Jet Operations Only)

Runway	All 2008		January		February		March		April	
	Arr	Dep	Arr	Dep	Arr	Dep	Arr	Dep	Arr	Dep
04L	5.8%	0.0%	3.0%	0.0%	2.0%	0.0%	4.6%	0.1%	9.7%	0.0%
04R	30.2%	5.7%	13.3%	2.6%	23.2%	3.5%	27.6%	3.6%	45.5%	8.2%
9	0.0%	32.7%	0.0%	16.0%	0.0%	24.8%	0.0%	30.6%	0.0%	49.8%
14	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
15R	1.7%	5.1%	2.0%	5.1%	3.2%	4.1%	1.3%	4.4%	2.8%	3.8%
22L	16.6%	1.1%	18.2%	1.4%	16.8%	1.5%	12.3%	1.1%	10.8%	0.6%
22R	0.0%	32.9%	0.0%	41.3%	0.1%	36.7%	0.0%	25.2%	0.0%	16.7%
27	33.2%	6.3%	42.5%	11.0%	40.7%	7.0%	36.5%	8.8%	22.6%	1.9%
33L	11.0%	16.1%	18.7%	22.6%	12.2%	22.4%	15.4%	26.3%	6.4%	19.0%
32	1.4%	0.0%	2.3%	0.0%	1.8%	0.0%	2.2%	0.0%	2.1%	0.0%

Runway	May		June		July		August	
	Arr	Dep	Arr	Dep	Arr	Dep	Arr	Dep
04L	8.8%	0.1%	3.7%	0.0%	4.2%	0.0%	9.3%	0.0%
04R	37.4%	7.2%	28.0%	5.4%	28.8%	5.1%	48.0%	11.1%
9	0.0%	40.7%	0.0%	25.4%	0.0%	28.3%	0.0%	48.3%
14	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
15R	0.5%	3.7%	0.1%	6.3%	0.6%	10.3%	0.6%	3.5%
22L	13.2%	1.0%	20.4%	1.5%	27.5%	1.7%	15.1%	0.7%
22R	0.0%	31.5%	0.0%	45.2%	0.1%	47.0%	0.0%	27.9%
27	29.0%	7.3%	40.0%	2.6%	34.2%	2.0%	22.2%	1.9%
33L	10.5%	8.5%	6.5%	13.7%	4.0%	5.6%	4.3%	6.5%
32	0.6%	0.0%	1.3%	0.0%	0.7%	0.0%	0.5%	0.0%

Runway	September		October		November		December	
	Arr	Dep	Arr	Dep	Arr	Dep	Arr	Dep
04L	10.2%	0.0%	7.9%	0.1%	4.3%	0.1%	1.1%	0.2%
04R	45.6%	8.6%	26.7%	5.3%	18.0%	2.3%	15.9%	3.5%
9	0.0%	50.4%	0.0%	29.7%	0.0%	27.2%	0.0%	16.2%
14	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
15R	3.1%	4.9%	0.3%	4.0%	5.7%	5.1%	0.8%	5.5%
22L	11.4%	0.7%	15.5%	1.2%	17.9%	1.2%	20.6%	0.9%
22R	0.0%	18.6%	0.1%	31.7%	0.1%	35.5%	0.0%	38.8%
27	21.8%	4.2%	33.8%	11.2%	38.5%	7.6%	38.5%	12.6%
33L	7.0%	12.5%	14.3%	16.7%	13.7%	21.0%	22.1%	22.3%
32	1.0%	0.0%	1.5%	0.0%	1.9%	0.0%	0.9%	0.0%

Table 4: Boston-Logan Departures by Aircraft Group and Hour – January 2010

		Scheduled Passenger						Cargo*	GA
Hour	**Period**	**I**	**II**	**III**	**IV**	**V**	**Subtotal**	**IV**	**I/II**
1	0000-0059	0	0	0	0	0	0	0	1
2	0100-0159	0	0	0	0	0	0	0	0
3	0200-0259	0	0	0	0	0	0	0	1
4	0300-0359	0	0	0	0	0	0	0	0
5	0400-0459	0	0	0	0	0	0	0	0
6	0500-0559	0	0	6	2	0	8	1	0
7	0600-0659	0	7	32	1	0	40	0	0
8	0700-0759	1	4	23	3	0	31	1	1
9	0800-0859	4	8	22	5	1	40	1	0
10	0900-0959	3	8	22	2	0	35	0	1
11	1000-1059	3	4	13	1	0	21	0	1
12	1100-1159	1	5	18	4	0	28	0	0
13	1200-1259	1	6	9	1	0	17	0	1
14	1300-1359	3	3	12	1	0	19	0	1
15	1400-1459	3	8	16	1	0	28	0	1
16	1500-1559	4	5	9	0	0	18	0	1
17	1600-1659	2	6	21	1	1	31	0	1
18	1700-1759	3	10	21	4	2	40	0	1
19	1800-1859	6	6	20	2	2	36	0	1
20	1900-1959	0	6	14	3	4	27	0	1
21	2000-2059	1	3	10	2	1	17	0	0
22	2100-2159	0	0	1	0	1	2	1	0
23	2200-2259	0	0	0	0	0	0	3	0
24	2300-2359	0	0	0	0	0	0	2	0
Total		35	89	269	33	12	438	9	13

Note: Scheduled passenger departures are for Wednesday. Cargo and GA departures are estimated based on recent trends.

* All cargo aircraft assumed to be Group IV (96.4% are Group IV)

Source: OAG Schedules

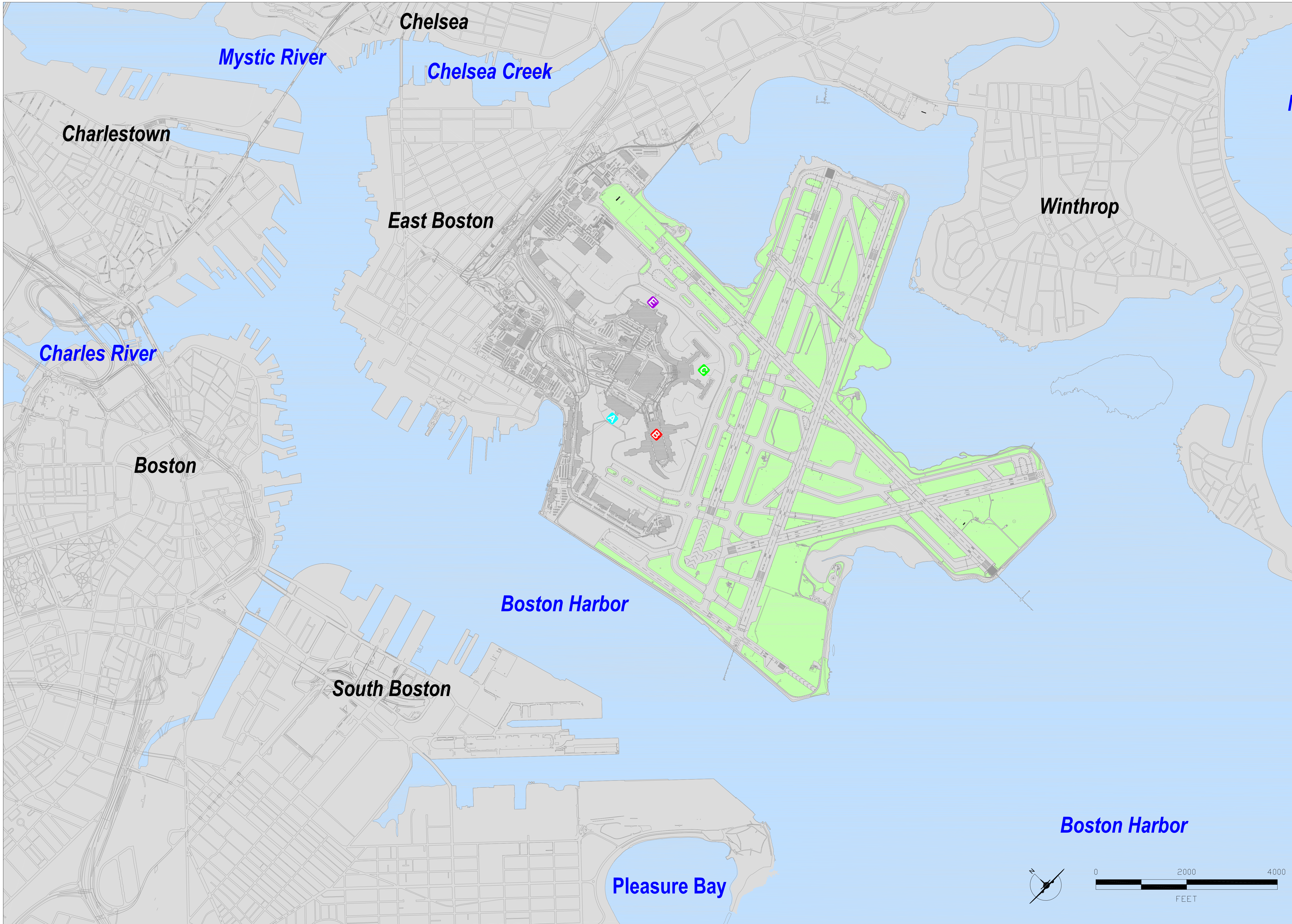


Figure 1

Logan Airport Location

Boston Logan International Airport

Massachusetts Port Authority

Capital Programs Dept.

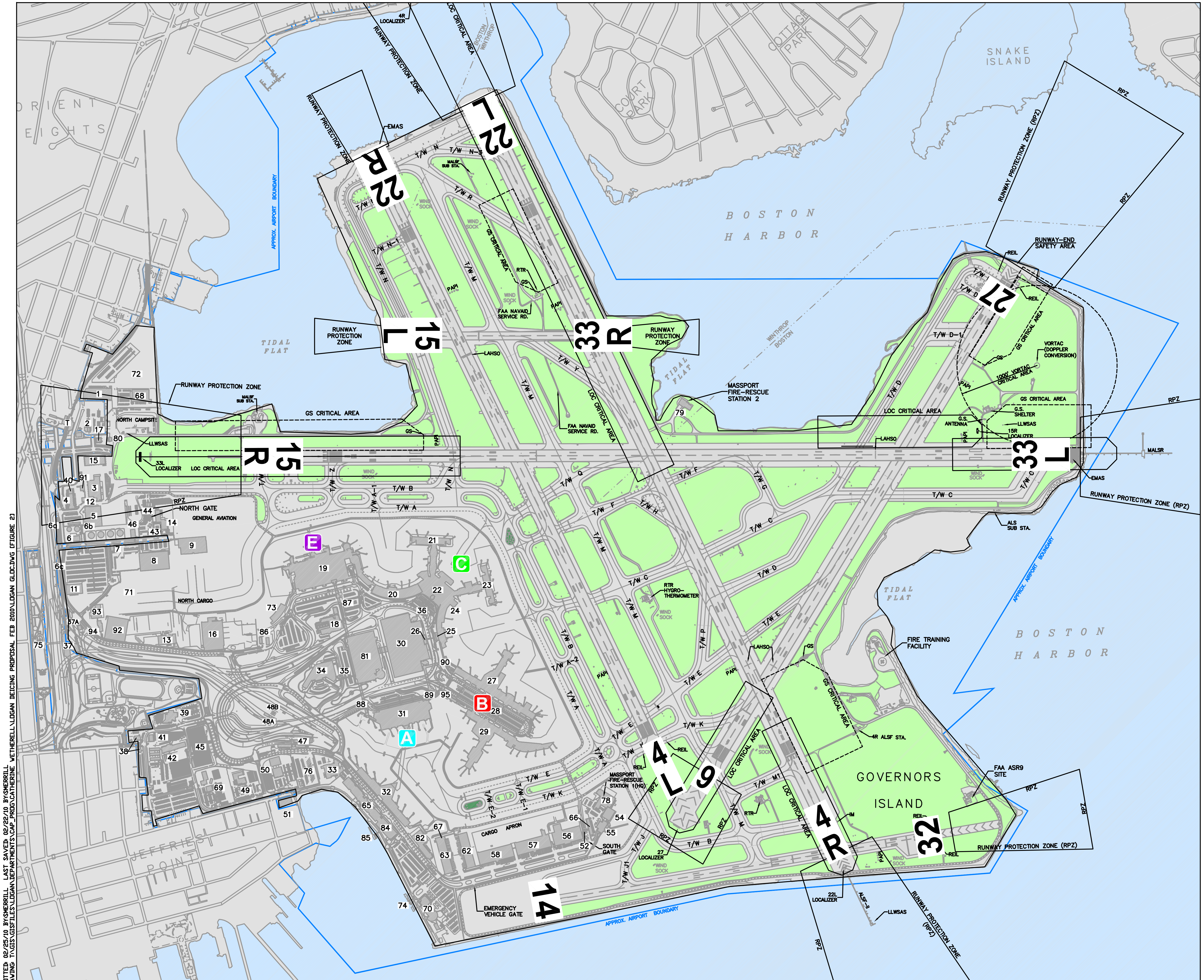
February 2010

massport

PLOTTED: 02/25/10 BY:SMERRILL LAST SAVED: 02/24/10 BY:SMERRILL
DRAWING: T:\GIS\GISFILES\LOGAN\DEPARTMENTS\CAP_PROG\CATHERINE WETHERELL\LOGAN DEICING PROPOSAL FEB 2010\HARBORWIDE.DWG [FIGURE 1]

Figure 2

Logan International Airport



Legend:

Approximate Massport Property Lines

Index of Prominent Airport Locations

1. Vacant
2. MPA Wood Island Substation
3. MPA Facilities II
4. MPA Facilities III
5. Hangar Building 5
6. MPA Pumping Station
6a. New MPA Pumping Station
6b. Electrical/Telecom Building
6c. Telecom Building
7. USPS Facility
8. Hangar Building 8
9. Hangar Building 9
10. Unassigned
11. Office Building
12. Salt/Sand Shed
13. Cargo Building 13
14. General Aviation
15. Large Vehicle Storage Building
16. Hangar Building 16
17. Salt/Sand Shed
18. MPA Facilities I / Heating Plant
19. Terminal E
20. Terminal C Pier A
21. Terminal C Pier B
22. Terminal C Main Terminal
23. Terminal C Pier C
24. Terminal C Pier D
25. MPA Administration Building
26. ATC Tower
27. Terminal B Pier A (American)
28. Terminal B Parking Garage
29. Terminal B Pier B (USAirways)
30. Central Parking Garage
31. Terminal A Main Terminal
32. Terminal A Satellite Terminal
33. Gate Gourmet Flight Kitchen
34. Hilton Hotel
35. Hilton Hotel Walkway
36. Terminal C Walkway
37. MBTA Airport Station
37A. Substation/Lift Station
38. Dollar Rent a Car
39. Avis Rent a Car
40. Electrical Maintenance Stockroom
41. Porter Street Substation
42. Hertz Rent a Car
43. Boston EMS Station A7
44. North Gate
45. Taxi Pool
46. BOS Fuel Farm/ Fuel Operations & Control Building
47. MTA/CAT Response Station/ Electrical Substation
48A. Toll Plaza at TWT
48B. Toll Plaza at TWT
49. Budget Rent a Car
50. Alamo/National Rent a Car
51. B.U. Office Building
52. South Gate
53. Unassigned
54. Amelia Earhart Hangar
55. Amelia Earhart Terminal
56. Cargo Building 56
57. Cargo Building 57
58. Cargo Building 58
59. Unassigned
60. Unassigned
61. Unassigned
62. Cargo Building 62
63. Cargo Building 63
64. Unassigned
65. Logan Office Center
66. Field Lighting Vault
67. BIF Electric Substation
68. Sky Chefs
69. Enterprise Rent a Car
70. Harborside Hyatt Hotel
71. CNG Fuel Station
72. Bus Maintenance Building
73. Terminal E West Bag Room
74. Water Shuttle Pier
75. Park Pavilion Building
76. Limo Pool
77. Unassigned
78. Massport Fire-Rescue Station 1 (HQ)
79. Massport Fire-Rescue Station 2
80. State Police K-9 Facility
81. West Parking Garage
82. Vent Building #7
83. Unassigned
84. Bird Island Flats Garage
85. Massport Marine Fire-Rescue Station 3
86. Gas Station
87. Terminal E Walkway
88. Terminal A Walkway
89. Terminal A South Walkway
90. Terminal B East Walkway
91. Central Stockroom
92. Hangar Building 92
93. Equipment and Facility Maintenance Building 93
94. Aircraft Maintenance Facility Building 94
95. Terminal B West Walkway

0 1200 2400
FEET

Logan International Airport
East Boston, MA

Massachusetts Port Authority
Capital Programs Department
February 2010

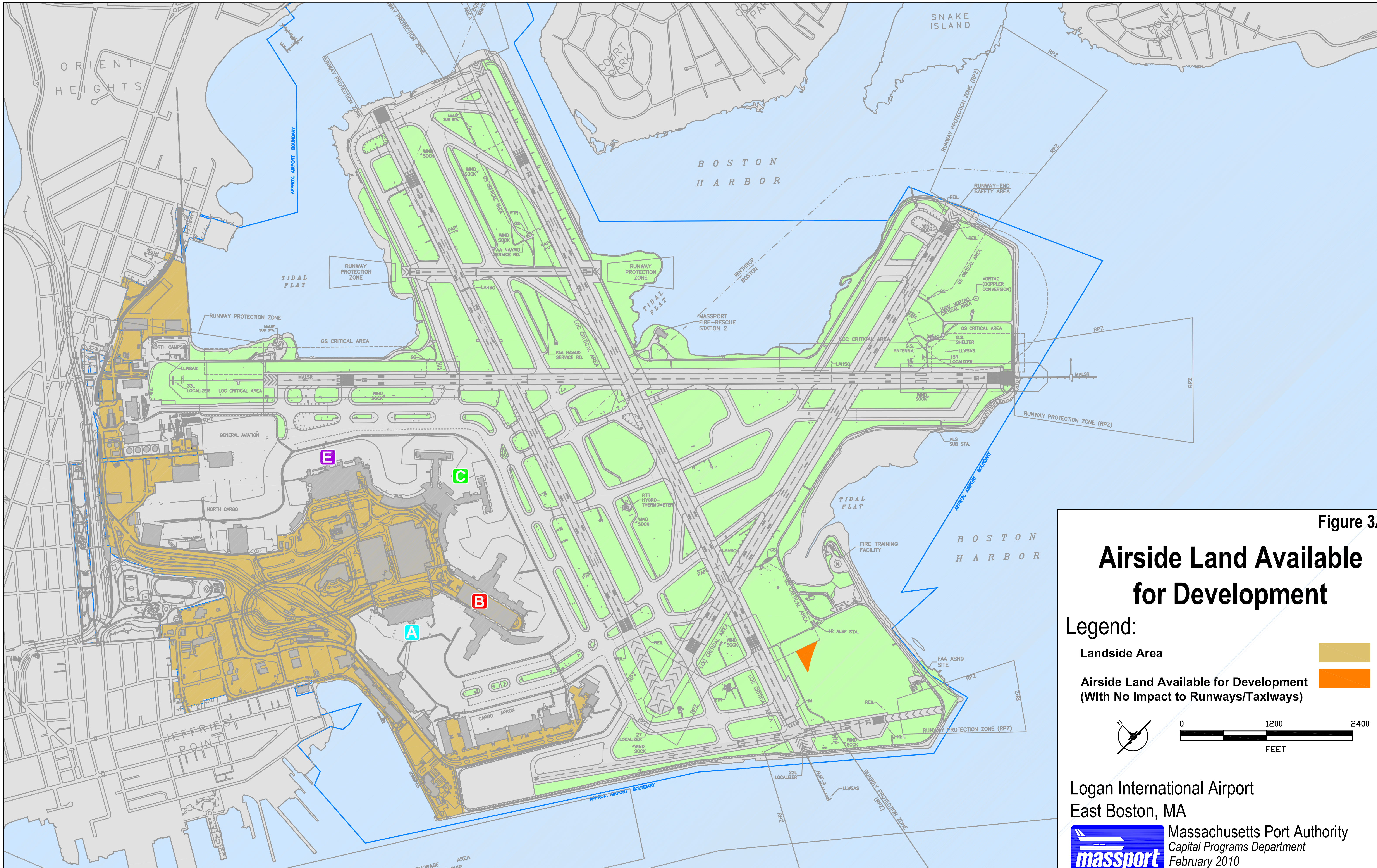


Figure 3A
Airside Land Available for Development
Legend:
Landside Area
Airside Land Available for Development
(With No Impact to Runways/Taxiways)
0
1200
2400
FEET
N
Logan International Airport
East Boston, MA
massport
Massachusetts Port Authority
Capital Programs Department
February 2010
BOSTON HARBOR
SNAKE ISLAND
ORIENT HEIGHTS
JEFFRIES POINT
TIDAL FLAT
RUNWAY PROTECTION ZONE
APPROX. AIRPORT BOUNDARY
GENERAL AVIATION
NORTH CARGO
CARGO APRON
MASSPORT FIRE-RESCUE STATION 2
FIRE TRAINING FACILITY
A
B
C
E

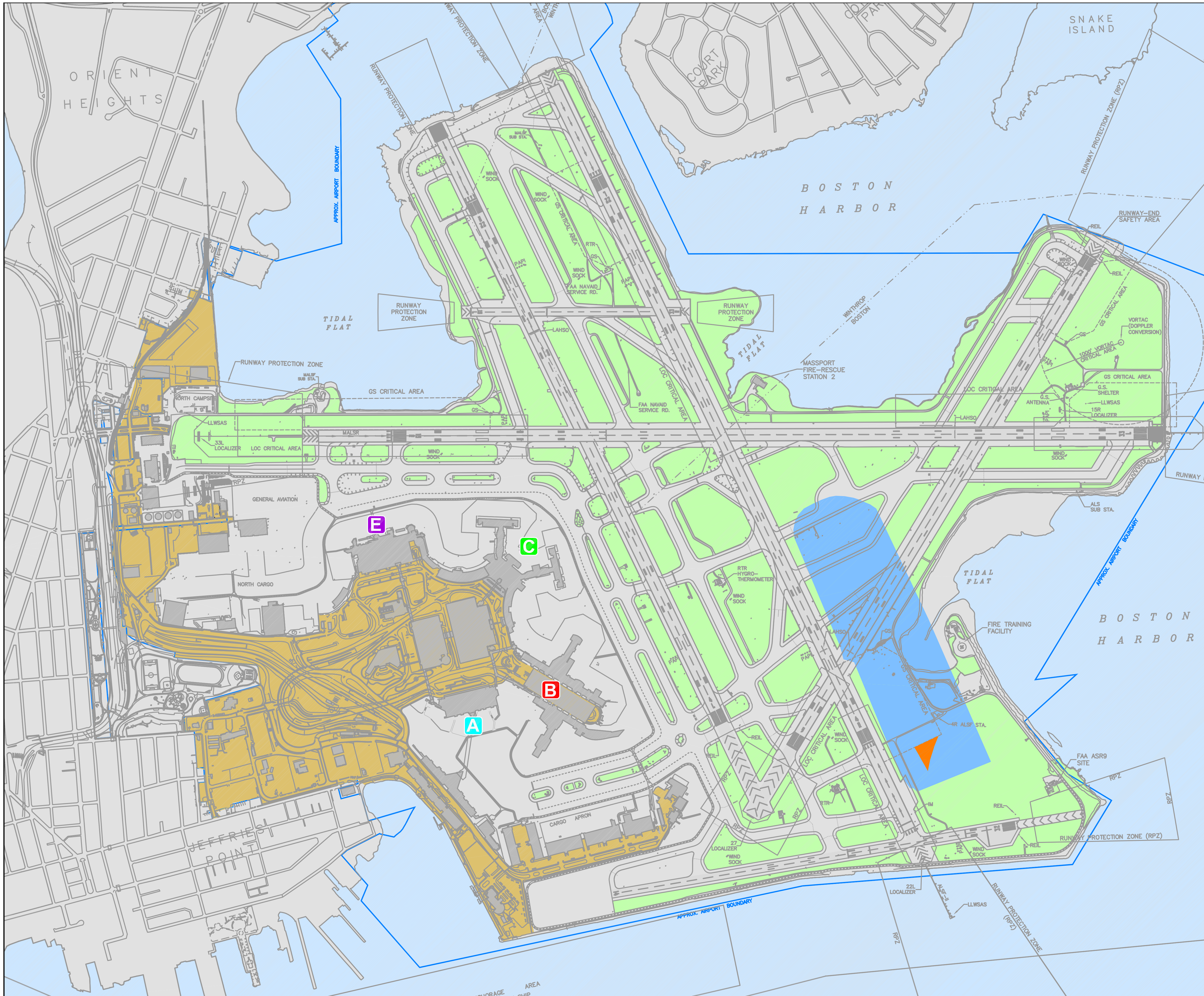


Figure 3B

Available Airside Land Vs. Needed Pad Size

Legend:

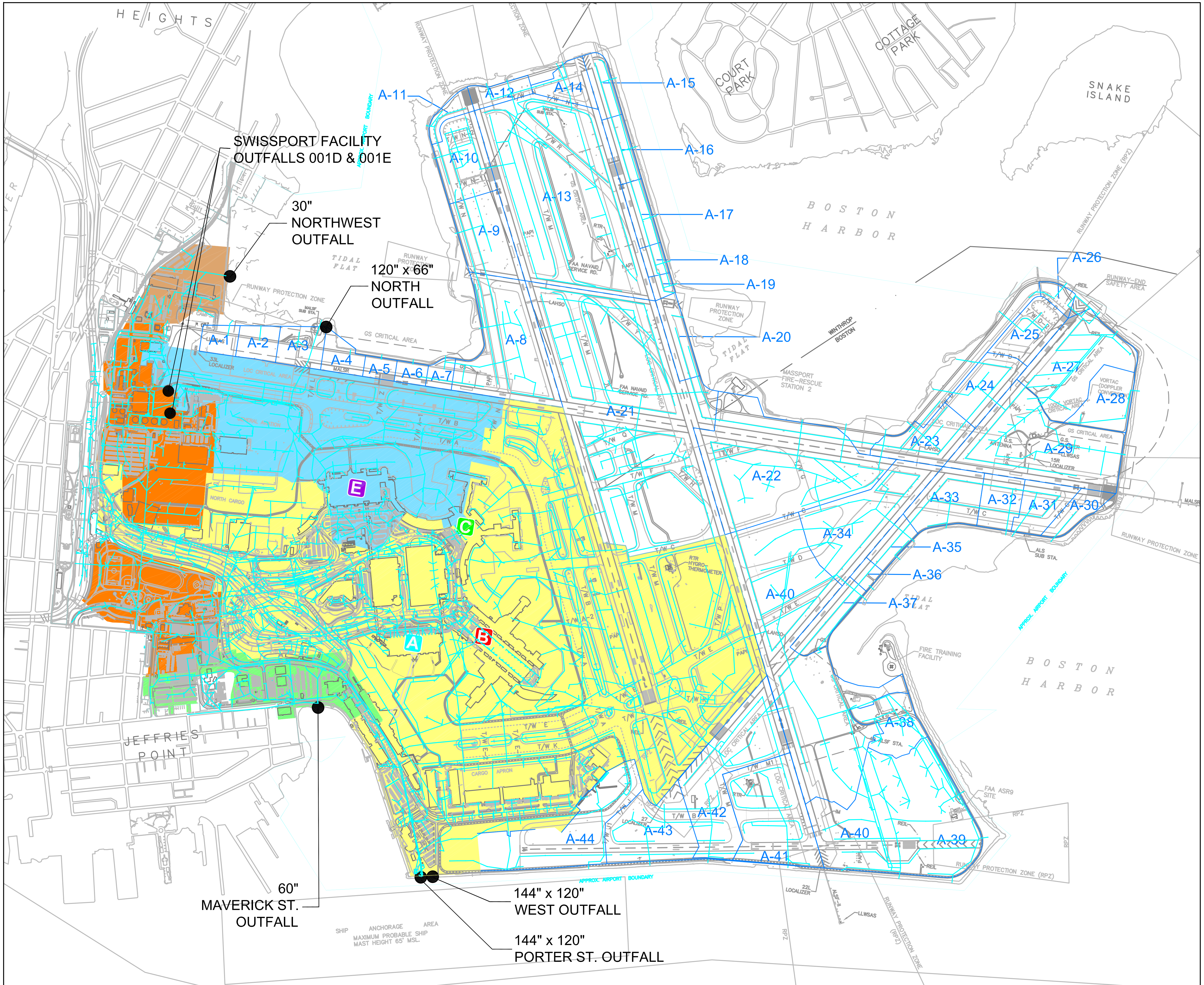
- Landside Area
- Airside Land Available for Development (With No Impact to Runways/Taxiways)
- Size of Deicing Area Needed

Logan International Airport
East Boston, MA

Massachusetts Port Authority
Capital Programs Department
February 2010

Figure 4

Logan International Airport Drainage Areas



Legend:

- Drainage Area Tributary to Porter St. Outfall
- Drainage Area Tributary to North Outfall
- Drainage Area Tributary to Northwest Outfall
- Drainage Area Tributary to Maverick St. Outfall
- Drainage Area Tributary to West Outfall
- A-13 Individual Airport Outfalls
- Stormwater Drainage Line

Logan International Airport
East Boston, MA

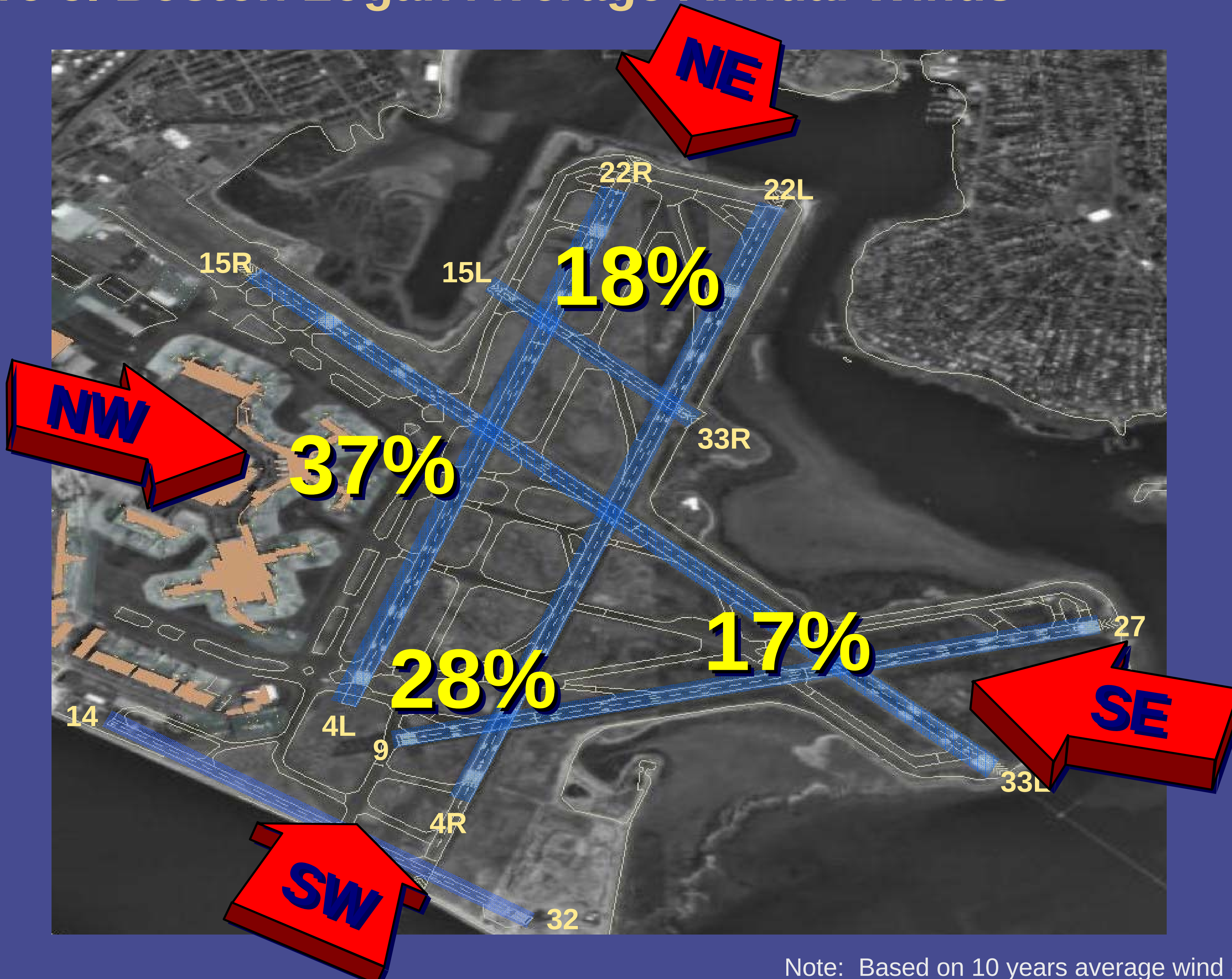
OUTFALL LOCATIONS AND DRAINAGE AREAS

October 2009

Logan International Airport
East Boston, MA

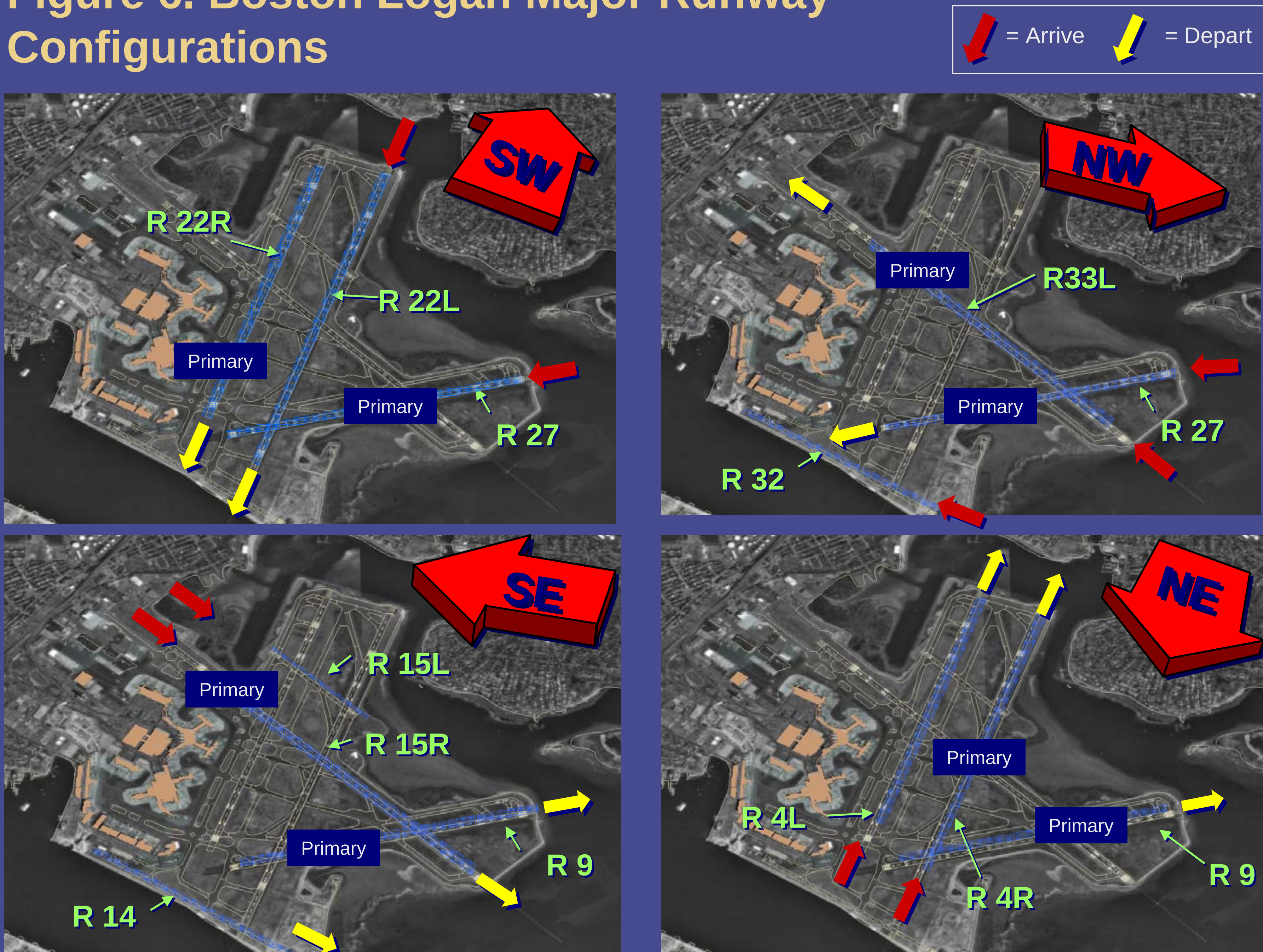
Massachusetts Port Authority
Capital Programs Department
Environmental Unit
October 2009

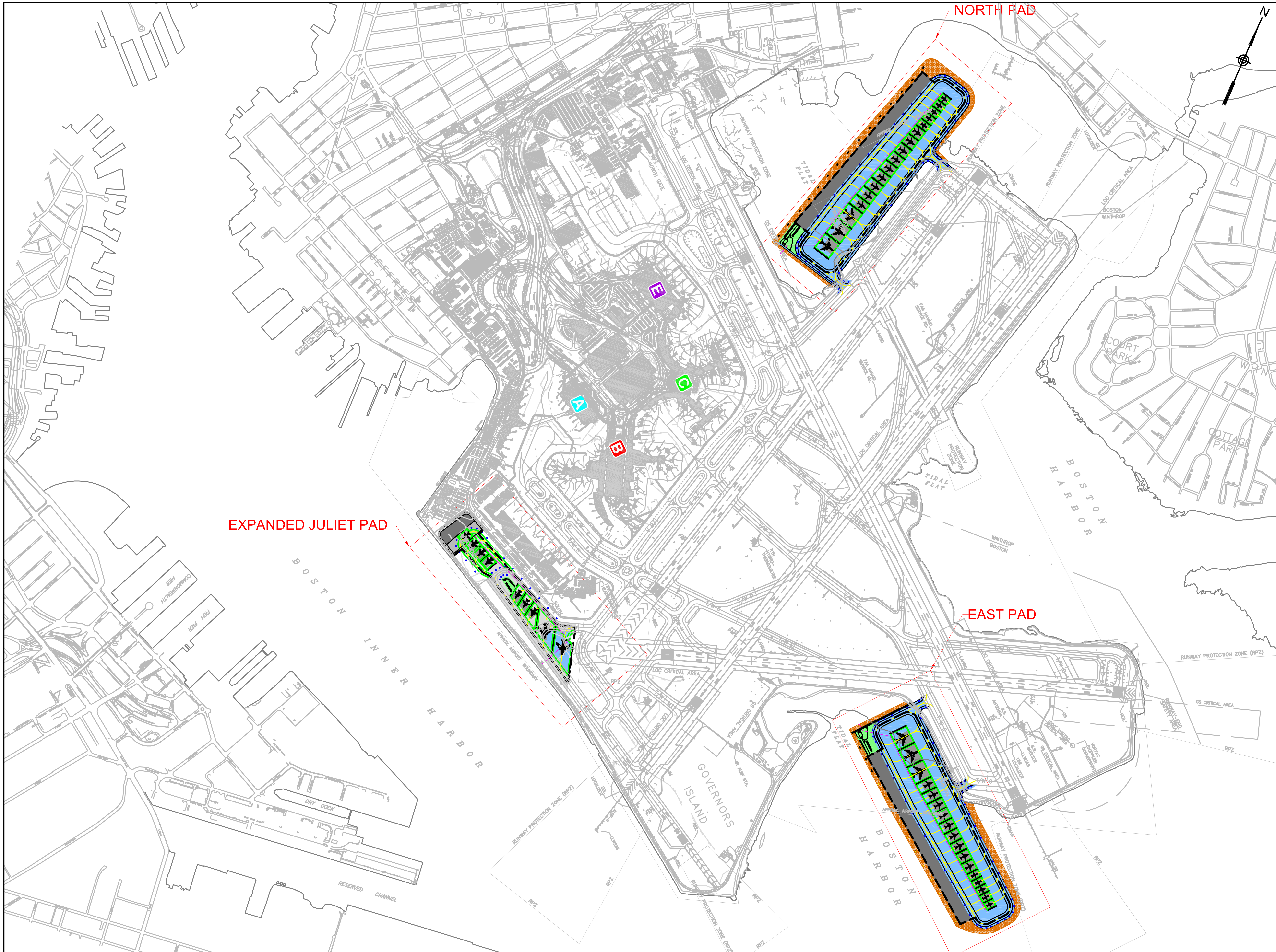
Figure 5. Boston Logan Average Annual Winds



Note: Based on 10 years average wind data.

Figure 6. Boston Logan Major Runway Configurations





LOGAN
INTERNATIONAL
AIRPORT

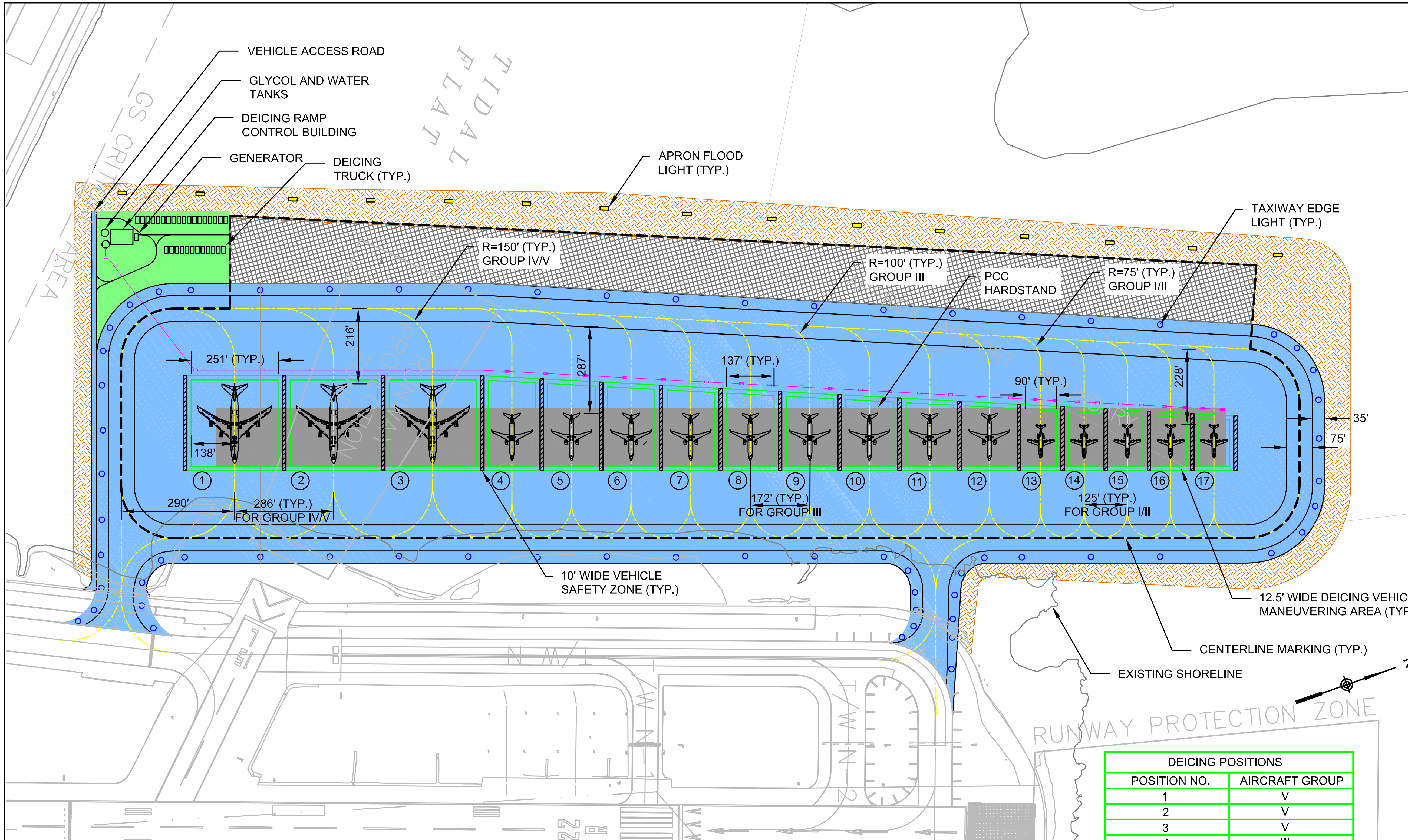
AIRPORT PLANNING UNIT
ECONOMIC PLANNING AND
DEVELOPMENT DEPARTMENT
MASSACHUSETTS
PORT AUTHORITY
NOVEMBER 2008

CH2MHILL

LEGEND:

NOT TO SCALE

FIGURE 7
CENTRALIZED DEICING PAD
LOCATION PLAN



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ECONOMIC PLANNING AND DEVELOPMENT DEPARTMENT
MASSACHUSETTS PORT AUTHORITY
NOVEMBER 2008

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LEGEND:

- SUPPORT AREA
- APRON FLOOD LIGHTS
- FLUSH-MOUNTED TAXIWAY EDGE LIGHT
- NEW HOT MIX ASPHALT (HMA)
- EXISTING PAVEMENT
- NEW PORTLAND CEMENT CONCRETE (PCC)
- NEW CONCEPTUAL DRAINAGE
- (1) AIRCRAFT DEICING POSITION
- SELECT EARTH FILL
- SNOW STORAGE AREA
- DEICING FLUID COLLECTION AREA

0 300 600

1"=300'

FIGURE 8
UPDATED CDF STUDY-2020 NORTH PAD

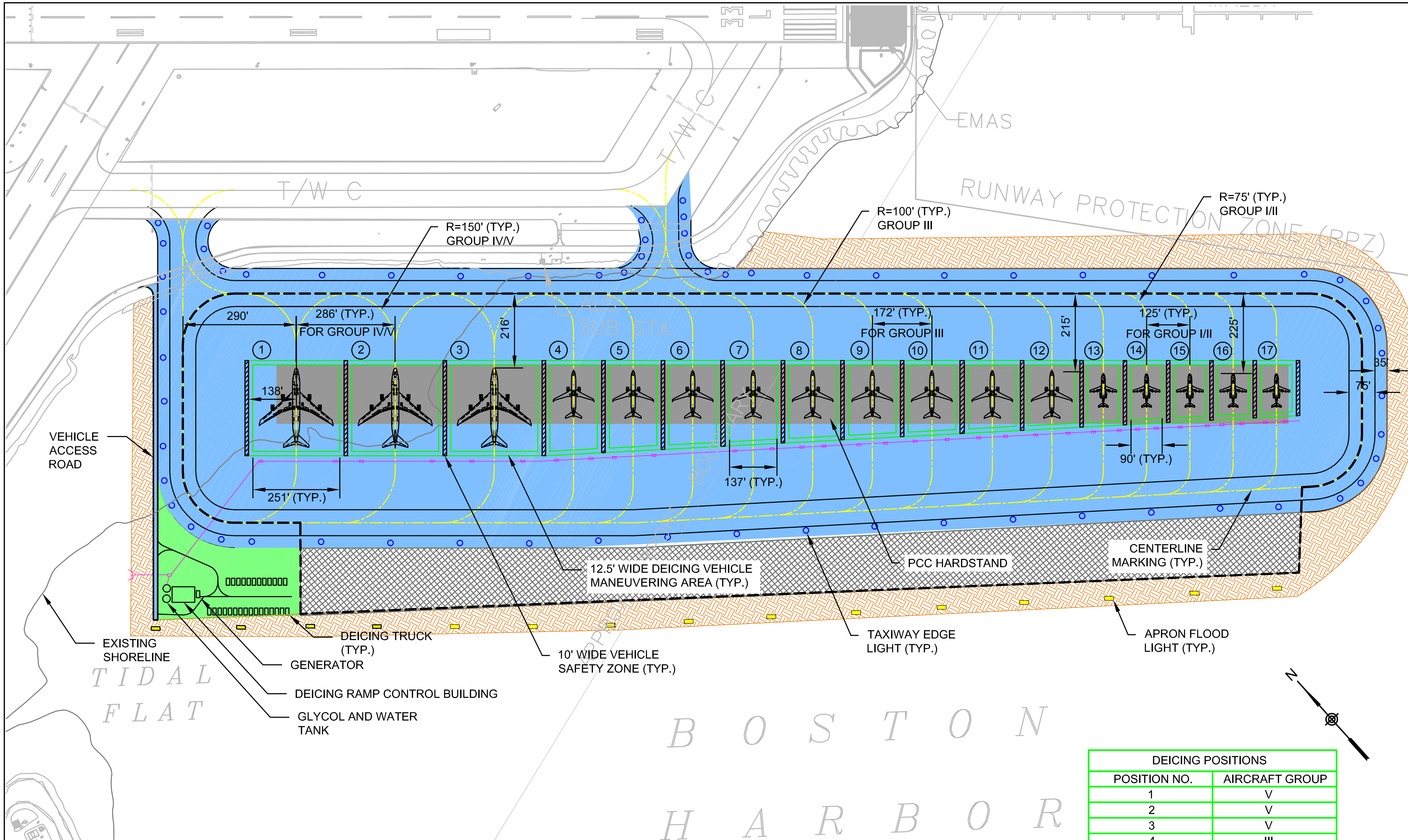
DEICING POSITIONS	
POSITION NO.	AIRCRAFT GROUP
1	V
2	V
3	V
4	III
5	III
6	III
7	III
8	III
9	III
10	III
11	III
12	III
13	II
14	II
15	II
16	II
17	II

NOTES:

1. GROUP V TAXILANE OBJECT FREE AREA = 276'.
2. LAYOUT PROVIDES FOR 3 GROUP IV/V, 9 GROUP III AND 5 GROUP I/II PADS.
3. DEICING PAD RADII MEET FAA AIRCRAFT DESIGN GROUP STANDARDS.
4. DRAINAGE IMPROVEMENTS ARE SHOWN CONCEPTUALLY.
5. SUPPORT AREA INCLUDES STAGING AREA FOR EQUIPMENT, MATERIALS, AND SUPPORT. FACILITIES
6. PAD DESIGNED FOR FULL USE AROUND THE PERIMETER FOR GROUP V AIRCRAFT.
7. PAD REQUIRES LAND PURCHASE, DEWATERING, PILE FOUNDATIONS AND EMBANKMENT CREATION IN THE TIDAL FLAT.
8. AIRCRAFT GROUP SHOWN IS MAXIMUM AIRCRAFT SIZE PERMITTED ON THE PAD. PAD MAY BE USED FOR MAXIMUM GROUP SIZE OR SMALLER.

SUMMARY OF AREAS

NEW HMA AND PCC PAVEMENT = 2,774,000 SQUARE FEET
DEICING FLUID COLLECTION AREA = 2,805,000 SQUARE FEET
SUPPORT AREA = 91,000 SQUARE FEET
SNOW STORAGE AREA = 500,000 SQUARE FEET



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DEVELOPMENT DEPARTMENT
MASSACHUSETTS
PORT AUTHORITY
NOVEMBER 2008

CH2MHILL

LEGEND:

- SUPPORT AREA
- APRON FLOOD LIGHTS
- FLUSH-MOUNTED TAXIWAY EDGE LIGHT
- NEW HOT MIX ASPHALT (HMA)
- EXISTING PAVEMENT
- NEW PORTLAND CEMENT CONCRETE (PCC)
- NEW CONCEPTUAL DRAINAGE
- (1) AIRFIELD DEICING POSITION
- SELECT EARTH FILL
- SNOW STORAGE AREA
- DEICING FLUID COLLECTION AREA

0 300 600

1"=300'

NOTES:

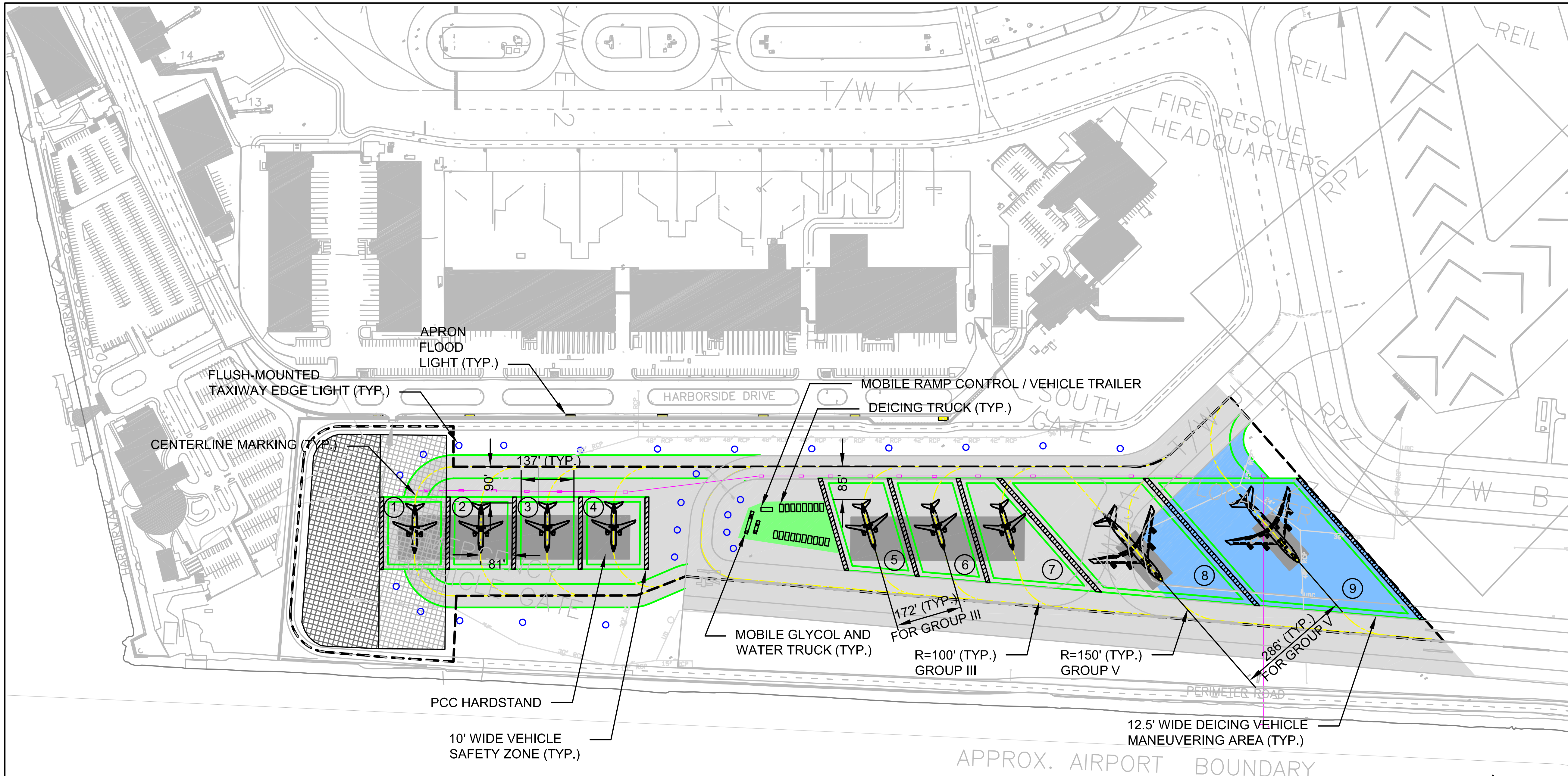
1. GROUP V TAXILANE OBJECT FREE AREA = 276'.
2. LAYOUT PROVIDES FOR 3 GROUP IV/V, 9 GROUP III, AND 5 GROUP I/II PADS.
3. DEICING PAD RADII MEET FAA AIRCRAFT DESIGN GROUP STANDARDS.
4. DRAINAGE IMPROVEMENTS ARE SHOWN CONCEPTUALLY.
5. SUPPORT AREA INCLUDES STAGING AREA FOR EQUIPMENT, MATERIALS, AND SUPPORT FACILITIES.
6. PAD DESIGNED FOR FULL USE AROUND THE PERIMETER FOR GROUP V AIRCRAFT.
7. PAD REQUIRES LAND PURCHASE, DEWATERING, PILE FOUNDATIONS AND EMBANKMENT CREATION IN THE TIDAL FLAT.
8. AIRCRAFT GROUP SHOWN IS MAXIMUM AIRCRAFT SIZE PERMITTED ON THE PAD. PAD MAY BE USED FOR MAXIMUM GROUP OR SMALLER.

SUMMARY OF AREAS

NEW HMA AND PCC PAVEMENT = 2,766,000 SQUARE FEET
DEICING FLUID COLLECTION AREA = 2,805,000 SQUARE FEET
SUPPORT AREA = 91,000 SQUARE FEET
SNOW STORAGE AREA = 500,000 SQUARE FEET

DEICING POSITIONS	
POSITION NO.	AIRCRAFT GROUP
1	V
2	V
3	V
4	III
5	III
6	III
7	III
8	III
9	III
10	III
11	III
12	III
13	II
14	II
15	II
16	II
17	II

FIGURE 9
UPDATED CDF STUDY -
2020 EAST PAD



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MASSACHUSETTS PORT AUTHORITY
NOVEMBER 2008

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LEGEND:

- MOBILE SUPPORT AREA
- APRON FLOOD LIGHT
- FLUSH-MOUNTED TAXIWAY EDGE LIGHT
- NEW HOT MIX ASPHALT (HMA)
- NEW PORTLAND CEMENT CONCRETE (PCC)
- JULIET PAD AREA
- NEW CONCEPTUAL DRAINAGE
- (1) AIRCRAFT DEICING POSITION
- SNOW STORAGE AREA
- ADDITIONAL SNOW STORAGE AREA (SEE NOTE 6)
- DEICING FLUID COLLECTION AREA

0 300 600

1"=300'

OPERATIONAL RESTRICTIONS/ISSUES:

1. THE JULIET PAD IS LOCATED IN AN AREA OF THE AIRFIELD THAT ENCOMPASSES A RUNWAY SAFTEY AREA FOR RUNWAY 14-32 AND CRITICAL FAA AIRSPACE SURFACES FOR RUNWAY 9-27. USE OF THE JULIET PAD IS LIMITED TO TIMES WHEN THESE RUNWAYS ARE NOT ACTIVE (EXCEPT FOR DEPARTURES FOR RUNWAY 9). WHEN THE JULIET PAD IS NOT IN USE, ALL VEHICLES AND EQUIPMENT MUST BE REMOVED.
2. PAD IS LIMITED TO FULL USE AROUND THE PERIMETER FOR GROUP III AIRCRAFT AND SMALLER. GROUP IV/V AIRCRAFT RESTRICTED TO POSITIONS 8 AND 9.
3. RUNWAY 14 AND TAXIWAY J WILL OPERATE AS A TAXILANE DURING DEICING OPERATIONS.
4. AIRCRAFT GROUP SHOWN IS MAXIMUM AIRCRAFT SIZE PERMITTED ON THE PAD. PAD MAY BE USED FOR MAXIMUM GROUP OR SMALLER.
5. MOBILE SUPPORT AREA AND EQUIPMENT MUST BE MOBILIZED / DEMOBILIZED FROM AN OFF-SITE LOCATION. NO ON-SITE STORAGE IS AVAILABLE FOR EQUIPMENT AND MATERIAL STORAGE.
6. GROUP V AIRCRAFT MUST OVERSTEER INTO POSITION 8 TO ALLOW FULL USE AROUND THE DEICING PAD IN ACCORDANCE WITH NOTE 1. GROUP IV AIRCRAFTAND SMALLER ARE NOT RESTRICTED TO OVERSTEERING INTO POSITION 8.

NOTES:

1. GROUP III TAXILANE OBJECT FREE AREA = 162'
2. LAYOUT PROVIDES FOR TWO GROUP IV/V AND SEVEN GROUP II/III PADS
3. DEICING PAD RADII MEET AIRCRAFT DESIGN GROUP STANDARDS
4. DRAINAGE IMPROVEMENTS ARE SHOWN CONCEPTUALLY
5. MOBILE LIGHTING AND SNOW MELT EQUIPMENT REQUIRED BUT NOT SHOWN
6. WHEN CONDITIONS WARRANT, DEICING POSITION 1 WILL BE CLOSED AND UTILIZED AS ADDITIONAL SNOW STORAGE AREA

SUMMARY OF AREAS

JULIET PAD AREA
(INCLUDES NEW AND EXISTING PAVEMENT) = 1,175,000 SQUARE FEET

NEW HMA AND PCC PAVEMENT = 298,000 SQUARE FEET

TOTAL SNOW STORAGE AREA = 197,000 SQUARE FEET

DEICING FLUID COLLECTION AREA = 1,107,000 SQUARE FEET

MOBILE SUPPORT AREA = 26,000 SQUARE FEET

DEICING POSITIONS

POSITION NO.	AIRCRAFT GROUP
1	III
2	III
3	III
4	III
5	III
6	III
7	III
8	V
9	V

FIGURE 10
UPDATED CDF STUDY - 2020 JULIET PAD